

# PATUXENT GREENS

## GREENVIEW DR AND CLUBHOUSE BLVD

# FLOODPLAIN STUDY NARRATIVE

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**PROFESSIONAL CERTIFICATION**

"I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 32113, EXPIRATION DATE: SEPTEMBER 15, 2019."



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**A. Summary of Floodplain Revisions**

1. Based on comments received from MDE during a meeting by phone on May 17, 2019, the following revisions or updates to the report and floodplain models have been made:
  - Manning Roughness Coefficient Justification (Section B, Appendix I)- MDE voiced concern that the friction factors for the compensatory storage area were too low to represent the proposed condition. However we feel that the values utilized at 0.025 were justified. This justification is due to the predominantly marshy environment with standing water which we do not believe would be capable of supporting woody vegetation, the shallow 3:1 slopes that border the compensatory storage area, and the intent of these border areas to be manicured and well maintained lawns. However, the manning's roughness coefficients were raised to the recommended 0.055 to demonstrate that even with the increase in roughness there would be no increase in floodplain elevations outside our LOD or on the Anne Arundel side of the Patuxent. This revision is reflected in the floodplain materials and models associated with this report.
  - Ineffective flow elevation of the compensatory storage area in the proposed condition: The outlet of the ineffective flow area in the proposed condition's model is set to elevation 112.5'. This elevation was established as the positive flow elevation by field survey data at the proposed outlet point for the compensatory storage area. This field survey data shows elevations as low as 111.76 (when adjusted by 0.74' to correlate the elevations from survey datum NGVD 29 to 88). All survey data in Prince Georges County is compiled in NGVD 29 per County standards and needs to be adjusted to NGVD 88 to coordinate with FEMA and MDE. Additional information regarding the compensatory storage area design was added to **Section E and the addition of Appendix N** was added to show an enlarged view of the proposed outlet areas design to address the outfall elevations.
  - Tractive force (Section G, Appendix M): The impacts of Tractive force have been expanded on and additional information regarding the impact assessment has been added.
  - Site photographs (Section C, Appendix H): The dates the site photos were taken have been added to Section C.
  - Cross-Sections in the Hec-Ras model are crossing when viewed in Geometric view- While this is purely graphic in nature and had no effect on any of the computed floodplain elevations in the model; it was revised so the crossings were eliminated.
  - Existing Hec-Rac cross sections do not match between the existing and proposed when viewed in Geometric view: While this is purely graphic in nature and had no effect on any of the computed floodplain elevations in the model; it was revised so the cross-sections matched graphically.
  - Floodplain cross sections in the Hec-Ras model do not appear to match the workmap: The workmap sections and the Hec-Ras model sections have been revised to more closely resemble each other. While an exact duplicate is not possible, since Hec-Ras and Autocadd will not allow a direct transfer of this information. Every attempt to depict them has been done.

In addition, due to the revisions to the friction factors mentioned above, floodplain sections, and tractive force calculations all of the summary tables and appendix have been updated with the new information as required.

2. Based on comments received from MDE during a meeting at Rodgers Consulting on 5/22/19 the following revisions or updates to the report and floodplain models have been made:
  - Compensatory storage outfall section #192774.7 should be updated to accurately model the outfall condition: The outfall section has been updated based on field run topographic shots and the updated model is included in this submission. Also, based on concerns about the ineffective flow area and how it is modeled, an additional section was added along the outfall for the compensatory storage area (section 192867.0) to further refine the outfall characteristics of the site in the proposed condition so they would be accurately reflected in the model. The new section was added across all of the existing and proposed models to verify there would be no increase in the floodplain elevations, and to address concerns brought up by MDE regarding the ineffective flow area and how it is affected by the outfall channel at elevation 112.2. To understand this we first need to understand how Hec-Ras looks at ineffective flow areas. Per the hec-ras manual (page 6-16,) *“Ineffective flows are often used to describe portions of a cross-section in which water will pond, but the velocity of that water, in the downstream direction, is close to or equal to zero.”* This means that when looking at the flow that can pass thru a particular section the areas designated as ineffective will fill like a bathtub, but no flow can leave the section until it rises above the ineffective flow area. With the compensatory storage area’s ineffective flow set at 112.5, this means Hec-Ras does not treat any area below this as conveying flow. Once the elevation of the flow at this section rises above the prescribed elevation Hec-Ras calculates the wetted perimeter available in the section for water to flow thru. Hec-Ras also considers the upstream and downstream cross-sections and the differences in the flow areas (constrictions, expansions) and then computes the floodplain elevation. It uses this information to apply the backwater caused by any constrictions in flow to the floodplain elevation in the next upstream section. By doing this Hec-Ras accounts for any constrictions in the channel or area of flow that would cause floodplain elevations to rise in upstream sections and adjust the elevations in the model accordingly. The addition of this section caused no increases in the floodplain sections upstream or downstream from the site, and minor increases and decreases (measured to the hundredth 0.01) thru the sites cross sections. None of the sections realized an increase in floodplain elevation over the existing models.
  - Redraw sections 192774.7, 193357.9, and 196568.8 to account for additional grading changes: These sections have been updated to add the slight variations in the ground between the 2’ contours that were picked up in the aerial topo to more accurately depict the existing ground elevations for these sections based on the best available information. These elevations were revised based on the aerial surface that was generated by our survey departments and with field generated topo data that was available in the area from previous site visits. The updated sections are reflected in the new model and outputs in Appendix A-E.
  - Update the top width of the separator dike in the Hec-Ras model to match the submitted plan showing the Modifications to existing levee: The hec-ras model has been updated to reflect the top of berm widths noted on the exhibit. In addition, the plan showing the modifications to the existing levee has been updated to depict elevations in the NGVD 88 datum to match the floodplain study datum for ease of comparison.
  - Verify the expansion and contraction coefficients have been utilized for the bridge modeled in section 20119: We verified that expansion and contraction coefficients were



utilized by FEMA along with ineffective flow areas on either side of the existing bridge for this section. The previously provided model, as well as the update model, shows an expansion coefficient of 0.5 and a constriction coefficient of 0.3 which is typical for sections immediately above and below a bridge or culvert.

- Add explanation of possible solutions for the separator dike: Updated information has been added to Section G of this report.
  - The compensatory outfall exhibit needs to be updated to more accurately depict the grading along this section in Appendix N: The exhibit has been updated to reflect elevations in NVGD 88, which matches the vertical datum of the floodplain model. Flow arrows and additional proposed contour lines have been added for clarity.
  - Address the flooding implications for the interim condition. Including if necessary, revising the sediment control sequence to include notes that the existing berm is not to be removed until a Step 2 MDE Dam Safety permit is issued and that the compensatory storage area should be excavated to the proposed elevations as one of the first steps of the plan: Appendix J: As reported by the current and prior owner of the property, no flooding events in recent history have exceeded the existing berm and flooded the site. To address MDE's concern regarding the interim condition and ensure the interim phase is adequately protected, the sequence of construction has been updated to reflect the excavation of the compensatory storage early and outline that the berm is not to be removed until the final stages of construction.
  - Update the sediment control plan to show final grading condition of the compensatory storage area in the proposed condition: The sediment control plan has been updated to show the final grading for the compensatory storage area.
  - Add updated justification for manning's roughness of 0.055 within the proposed compensatory storage area: Additional justification for the manning's roughness coefficients utilized thru the proposed compensatory storage area has been added to Section D. Originally and earlier on, the concept was that the compensatory storage area could become a forested wetland. As groundwater monitoring studies have progressed, it has become apparent that a forested wetland is not viable, and that the wetland site will be a predominantly aquatic and herbaceous plant community. Combined with maintenance responsibility specification and requirements for wetland plantings as part of the Phase 2 mitigation plan, the proposed 0.055 roughness coefficient is justified.
  - Add the cover of the printed Hec-Ras report and the summary table to Appendix L: The requested information has been added.
3. Based on comments received from MDE during a meeting at MD's Baltimore office on 6/05/19 the following revisions or updates to the report and floodplain models have been made:
- Raise the ineffective flow in the compensatory storage area for the Golf Course raised from elevation 112.5 to 115.0. : This revision was made and all of the effected exhibits, models, and tables have been updates with the new floodplain elevations. No increases were realized in the floodplain based on this change to the existing off site conditions or the existing conditions when modeled with berm on the Anne Arundel side of the Patuxent River.
  - Add source of the topographic data for the floodplain study: The requested topographic data information has been added to section C of this report.

**B. Introduction**

Patuxent Greens Golf Course is located at 14415 Greenview Drive within the municipal limits of the City of Laurel, Maryland. The site is located near the intersection of Greenview Drive and Clubhouse Boulevard. The site is 191.75 acres and is recorded as Amenity Area Patuxent Greens Golf Course on Plat No. 126059 in the Prince George's County Land Records. The property is bordered by single-family detached and multifamily dwelling units to the west, forested land to the south, the Patuxent River to the east, and vacant City property to the northeast.

The property was previously used as an 18-hole golf course containing a clubhouse, pro-shop, maintenance sheds, parking lot, paved golf cart trails, driving range, and irrigation ponds. The golf course is no longer functional and all of the site buildings are no longer in use. The site is generally flat with rolling hills, berms, and sand bunkers within the golf area. Earthen berms are currently located along the Patuxent River and Bear Branch edges to keep flood waters from entering the site. Several interconnected irrigation ponds exist through the middle of the site that drain south to a pond that regulates the water level with a large pumping station. Neither the berm nor the pumping station are proposed to remain. The site contains emergent wetlands, non-tidal vegetated wetland buffers, and irrigation ponds. About 2,800 feet of Bear Branch runs through the northeastern part of the site. The property ultimately is part of the Upper Patuxent River watershed.

The retirement of the golf course provides an opportunity to improve the existing environmental and economic conditions of the site and neighborhood through redevelopment. CS Patuxent Greens, LLC intends to redevelop the site with a mix of housing. This new land use should improve water quality by replacing an outdated golf course located immediately adjacent to Bear Run and the Patuxent River. Golf Course runoff typically is high in nutrients loading such as Nitrogen and Phosphorous due to the maintenance requirements of golf course greens and fairways. This use will be replaced with a new community that will have all site runoff treated to modern water quality standards.

In addition to improving water quality the redevelopment will provide additional housing choices in an area of high housing demand. The project has received approval from the City of Laurel to construct 389 dwelling units comprised of a mixture of single-family detached and attached houses of various sizes. The site has also received an approved CLOMR from FEMA and various engineering approvals through Prince Georges County. The purpose of this narrative is to demonstrate to the Maryland Department of the Environment that this redevelopment can be achieved while also mitigating flood risk for both new residents and the adjacent property owners.

**Please note that all elevations stated in the report are to vertical datum NGVD 88 as required by FEMA and MDE while all site construction plans are in vertical datum NGVD 29 due to County requirements. To adjust elevations from NGVD 88 to NGVD 29 it is necessary to add 0.74' to all of the NGVD 88 elevations.**

**C. Hydrologic Methods, Assumptions, and Patterns**

Floodplain hydraulic computations were performed using the U.S. Army Corps of Engineers HEC-RAS version 4.1 run in subcritical flow mode. Cross sections from FEMA were utilized. We obtained FEMA's Hec-Ras data from FEMA to assist in supporting our design.

Discharge values were found from FEMA's Hec-Ras and FIS Reports. The discharge for the Patuxent River was found in the FIS Report to be 26,267 CFS about 1,100 feet downstream of Ft. Meade Road in Laurel Maryland. FEMA used this discharge in Hec-Ras and for the extents of our entire site in their study. Therefore, a peak discharge of 26,267 cfs (Cubic Feet per second) was utilized. Section 190879.0 was the farthest downstream cross section and 201119 was the farthest upstream cross section utilized for this study. These FEMA cross sections set our water surface elevation boundary conditions in the Hec-Ras model. This ensured proper tie-in to the existing floodplain just upstream and downstream of our site. For the length of our site, the cross sections from FEMA's FIRM maps were updated for the proposed elevations and existing topography. The existing topography is based on aerial topography flown and prepared by McKensie Snyder which was verified by field run topo by Rodgers consulting, and supplemented with Prince George's County's 2' GIS topography for areas outside of the boundary of the flown topo. This information, along with our sites proposed grading, were used to establish revised channel widths, left of banks, and right of banks elevations for conditions explained below in both the existing models and the final proposed model.

**Existing Floodplain Models**

Various models were revised throughout an iterative process in coordination with MDE. In order to account for differing floodplain conditions on opposite sides of the Patuxent River caused by the berm that surrounds the golf course, two (2) existing conditions models were developed. These were used to accurately map the floodplain effect of the existing berm on the Anne Arundel County side of the Patuxent River and the floodplain in the event of a berm failure on the City of Laurel side of the Patuxent River. These are the worst case scenarios for the 100-yr floodplain inundation limits. A description of each model is located below.

Existing Conditions Model without Berm

The existing effective FEMA model was modified in coordination with MDE to add additional cross sections that would coincide with those added to the proposed conditions model, and to update the existing FEMA sections to align with the sections as drawn in the proposed conditions. This was done to get an accurate comparison between the existing and proposed conditions. The Manning's Roughness Coefficients were also revised to match the proposed conditions and were based on site visits and photos of the floodplain areas vegetation. The elevations from this model were used to map the existing floodplain limits on the City of Laurel side of the Patuxent River to depict the 100-yr floodplain inundation limits in the event of berm failure. **(See Section C below and Appendix I for a full explanation of each sections Manning's Roughness Coefficient revisions and Appendix H for site photos).**

Existing Conditions Model with Berm

The existing effective FEMA model was modified in coordination with MDE to add additional cross sections that would coincide with those added to the proposed

conditions model, to account for the existing berm surrounding the golf course acting as a levee to the model, to add ineffective flows throughout the golf course for any elevation on the golf course below the outlet elevation, and to update the existing FEMA sections to align with the sections as drawn in the proposed conditions. This was done to get an accurate comparison between the existing and proposed conditions. The Manning's Roughness Coefficients were also revised to match the proposed conditions and were based on site visits and photos of the floodplain area vegetation. The elevations from this model were used to map the existing floodplain limits on the Anne Arundel County side of the Patuxent River to depict the 100-yr floodplain inundation limits due to the effects by the existing berm. **(See Section C below and appendix I for a full explanation of each sections Manning's Roughness Coefficient revisions and Appendix H for site photos).**

#### **Proposed Conditions Model with Berm Removed and New Levee**

The proposed model was developed utilizing the proposed site topography within the proposed development and modifying the existing effective FEMA model to include the updated elevations for the proposed development. This model was further modified in coordination with MDE to add additional cross sections to areas of concern, to account for the existing berm surrounding the golf course being removed, to add ineffective flows throughout the compensatory storage areas for any elevation below the outlet elevation, and to add a new levee along the north east property line on both the development and City property. This levee was added in coordination with the City to bring areas outside the 100-yr floodplain that are currently inundated. The elevation of the outfall channel to the south is 112.2, but to be conservative the ineffective flow area within the compensatory storage area was set to 115.00. Once the existing berm is breached at this location, the water stored in the compensatory storage area will be allowed to freely discharge into a channel with an elevation of 112.2. By using a more conservative elevation for the area of ineffective flow the proposed conditions Hec-Ras model only allows water to discharge from the compensatory storage area once it reaches an elevation of 115.0. This creates a more conservative floodplain model of the effects of the development on the floodplain. The Manning's Roughness Coefficients were also revised to match existing site conditions within our area of study. These were based on site visits and photos of the floodplain areas vegetation. The elevations from this model were used to map the proposed floodplain limits of the Patuxent River to depict the 100-yr floodplain inundation limits **(See Section C below and Appendix I for a full explanation of each sections Manning's Roughness Coefficient revisions and Appendix H for site photos).**

These models differed from previous models as follows:

#### **Existing Conditions Model without Berm**

- Manning's Roughness Coefficients were revised to match the proposed condition
- Additional sections were added above what was on the approved FEMA existing conditions model to match the proposed floodplain model
- A new cross-section was added across all models (192867) along the outfall of the compensatory storage area to more accurately model the outfall characteristics

#### **Existing Conditions Model with Berm**

- Manning's Roughness Coefficients were revised to match the proposed condition
- Additional sections were added to match those in the proposed floodplain model
- The berm around the site was added to show its impacts to floodplain elevations.
- A new cross section (192867) was added at the outfall of the compensatory storage area.

Proposed Conditions Model with Berm Removed and New Levee

- The proposed levee was added
- Friction factors were increased from the approved FEMA model per MDE.
- The top width of the separator berm was revised to match the design cross sections.
- A new cross section (192867) was added at the outfall of the compensatory storage area.

After running the models with all of this information, new water surface elevations were assigned to each cross section based on the Hec-Ras output. The new 100-yr floodplain was then delineated, and is demonstrated on the revised floodplain work map

**D. Manning's Roughness Coefficient Justification**

Manning's Roughness Coefficients were revised from the original duplicate effective FEMA model across all revised existing and proposed floodplain to match the site and floodplain conditions in areas that warranted. These were revised across both the existing conditions and proposed conditions models to match. This was done to depict the exact effect that the project would have on the floodplain elevations thru both models. The friction factors explained below were taken from table 3-1 of the U.S. Army Corps of Engineers HEC-RAS River Analysis System Hydraulic Reference Manual Version 4.1 dated January 2010. The friction factors within the limits of disturbance for the site were set based on the proposed site conditions.

The compensatory storage area is going to be designed, under the conditioned Phase 2 Mitigation Plan that MDE will review and approve, and constructed as an emergent wetland. Originally, it was speculated that this area would become a forested wetland. However, upon obtaining the results of groundwater monitoring showing very high groundwater levels, the area is going to be designed, constructed and maintained as a partially inundated wetland that will be characterized as a mosaic of predominantly aquatic and herbaceous vegetation. We are proposing that a design parameter of the Phase 2 Mitigation Plan be the use of the qualitative criteria of a Manning's coefficient of 0.055 for the compensatory storage area. Friction factors within our study area but outside the LOD were revised based on a site visit conducted on August 13<sup>th</sup> 2017 by our survey crew that was also utilized to document stream cross sections and elevations along the length of the Patuxent River and Bear Branch within the study area. To further document the existing off site conditions, photos of the offsite areas were taken on May 2<sup>nd</sup> and 10<sup>th</sup> 2019 and are included in Appendix H and Table 3-1 of approved Manning's values is included in Appendix I of this report. Please find below a section by section breakout of the revised friction factors.

**Section #20119**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.03.

**Section #201058.7**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent River. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #20115.4**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent River. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #198588.0**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 4'-5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow

below, rather than above the branches fit a typical range of 0.08-0.12, so a median manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 manning's was utilized. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

#### **Section #197599.6**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

#### **Section #196568.8**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a

Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #196356.8**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #195583.1**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's roughness coefficient for the channel remained unchanged from the original FEMA model at 0.035.



**Section #194817.8**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #193854.4**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #193357.9**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during

the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The Manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded, there will be no trees in the compensatory area and the area will consist of a mosaic of predominantly standing water, aquatic and herbaceous vegetation, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

#### **Section #193176.6**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The Manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded there will be no trees in the compensatory area and the area will consist of pastures with no brush and high grass, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.03.

#### **Section #192867**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 2'-4' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of

the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. In addition, for the right of bank areas that crossed through our sites limits of disturbance the Manning's roughness values were revised from 0.055 to 0.035 in the proposed compensatory area. The Manning's value of 0.055 utilized by FEMA is typical of light brush and trees. As this area will be regraded there will be no trees in the compensatory area and the area will consist of pastures with no brush and high grass, which is typical for a Manning's roughness of 0.055. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.03.

**Section #192774.7**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 4'-5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on the Anne Arundel County side of the Patuxent River. Due to the thinner tree distribution thru the floodplain on the City of Laurel side of the Patuxent River a minimum value for the same category of cover of 0.08 Manning's was utilized. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #192514.9**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent River. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.035.

**Section #191681.5**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow

below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent River. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.03.

**Section #190879.0**

For forested areas in this section, FEMA utilized 0.12 for the Manning's n value which is representative of the normal Manning's Roughness Coefficient for a heavy stands of timber, few trees down, little undergrowth, and flow into the branches. Based on site visits and known water surface elevations of approximately 5' for this section during the 100-yr storm event, it was concluded that the flow would never be close to flowing into the branches and the forest was not dense enough to be considered a heavy stand of timber. Manning's values for the same description utilized by FEMA but with flow below, rather than above the branches fit a typical range of 0.08-0.12, so a median Manning's value of 0.10 was used rather than 0.12 on both sides of the Patuxent River. The Manning's Roughness Coefficient for the channel remained unchanged from the original FEMA model at 0.03.

**E. Berm Modifications and Proposed Levee**

The existing berm that surrounds the site will be removed for the majority of the site's perimeter to a final design elevation of 117.25 (NGVD 88) for the majority of the site. At the southernmost end of the site, adjacent to the existing pump house, the berm will be removed in its entirety to an elevation of 112.0 for a distance of over 400 lf. This will open the existing floodplain allowing the 100-yr storm to overflow the berm filling the compensatory storage area and out falling thru the opening in the southern portion of the berm. The removal of this impediment to the flow in the Patuxent River will reduce flood elevations by allowing the floodplain to expand back to its natural limits. The final design and stability of the separator dike requires additional coordination with MDE thru an approved work plan for soils analysis to establish the existing berm's stability and to determine if additional reinforcement in this area will be needed to stabilize the berm. There are a number of possible engineering solutions that will allow the separator berm to work effectively but these will depend on the stability of the soil analysis. A few of those options are outlined below:

1. If the berm is determined to be stable thru geotechnical analysis. Then no modifications may be needed. This will need to be verified and documented thru geotechnical investigation and soil borings
2. If stability is deemed to be an issue. The installation of dedicated armored inflow points for flow to overtop the berm could be incorporated.
3. If the berm's total stability is in question, the installation of a CMI wall (similar to the levee system being proposed) can be utilized to stabilize the berm with dedicated inflow points to the compensatory storage area to mitigate the possible erosion of the Berm.

In addition to the berm removal, a new levee will be constructed along the site's northern boundary with Bear branch and extend onto City property to protect the existing condo development along Parkview Way and Snead Court from inundation during the 100-yr flood event. This levee will be designed in coordination with MDE Dam Safety to meet FEMA criteria which requires 3' of free board

above the 100-yr storm event. Preliminary sections and a plan view location has been included in appendix K of this report.

These items, including further design and soils investigation, will be undertaken in coordination with MDE Dam Safety as part of the Step 2 Dam Safety authorization

#### **F. Compensatory Storage Area**

To meet City requirements, a compensatory storage area will be excavated on a portion of the site to mitigate floodplain impacts. This area will allow for additional storage of floodwaters that will be displaced by elevating a portion of the floodplain. Due to the high ground water in this area there is a possibility of groundwater intrusion into this area. This has been depicted in the floodplain models with areas of ineffective flow. The existing berm will be lowered to elevation 117.25 (NGVD 88). At the southernmost end of the site, adjacent to the existing pump house, the berm will be removed in its entirety to an elevation of 112.0 (NGVD 88) for a distance of over 400 lf. This will open the existing floodplain allowing the 100-yr storm to overflow the berm filling the compensatory storage area and out falling thru the opening in the southern portion of the berm. The flow will empty the compensatory storage area thru a channel with an outfall elevation of 112.2 at the southern edge of the property and discharge into the Patuxent River. The elevation of the outfall channel to the south is 112.2, but to be conservative the ineffective flow area within the compensatory storage area was set to 115.00. Once the existing berm is breached at this location, the water stored in the compensatory storage area will be allowed to freely discharge into a channel with an elevation of 112.2. By using a more conservative elevation for the area of ineffective flow the proposed conditions Hec-Ras model only allows water to discharge from the compensatory storage area once it reaches an elevation of 115.0. This creates a more conservative floodplain model of the effects of the development on the floodplain. As discussed above, the separator dike around this area will be further refined and designed to verify stability in coordination with MDE Dam Safety. **(See Appendix N for Compensatory Storage outfall Exhibits)**

**To test the potential impact of the hydraulic conditions associated with the compensatory storage area and its outfall, section 192867 was added. This section was added thru the area of the existing berm that surrounds the site and which is to be removed in the proposed condition to allow the compensatory storage area to outfall. This allowed us to model the change in flow in the compensatory storage area from the existing (when the levee is holding water) to the proposed condition (when it has been removed).**

#### **G. COMAR 26.17.04.04(B)**

This section of COMAR provides general requirements for permit applications. Please find below a list of the items required by this section and our responses to each.

- A. An application to the Administration shall include all studies, surveys, calculations, tests, and data necessary for determining the adequacy of the project design. The degree of investigation needed for a specific project is a matter of the Administration's judgment based upon the magnitude and impact of the project and the complexity of the site. The applicant shall demonstrate to the Administration that sufficient investigations have been made and that adequate allowances have been applied to the design. The Administration may waive a requirement not pertinent to the decision. In addition, the Administration may require the submission of additional information or data it finds appropriate.

*We believe that the associated submittal package meets or exceeds all of these requirements. These studies show that there will be no increase in the 100 yr. floodplain elevation due to the project.*

- B. An application to the Administration shall include evidence of the benefits to be derived from the project. This evidence shall be stated in monetary terms or, when more appropriate, other quantitative or qualitative terms.

*This application fully outlines the benefits to the City of Laurel that will be derived from this project. The golf course is currently closed and therefore the City is not currently deriving any benefit from the site. The development will provide and increase in the tax base for the City along with providing over \$10 million dollars in impacts fees for public Safety, Schools, City Police, and to the City. Additional benefit will be realized in the stream quality of the Patuxent and Bear Branch rivers. This will be accomplished by the implementation of stormwater management treatment to meet modern water quality standards.*

- C. A proposed project shall be consistent and compatible with overall basin, flood management, or watershed development plans, if any, prepared, adopted, or approved by the State or a local jurisdiction.

*We believe that the associated submittal package meets or exceeds all of these requirements.*

- D. An environmental study of the significant effects of the project may be required of the applicant by the Administration. The Administration may require that the study include an inventory of the existing vegetation, fish, wildlife, scenic, recreational, and historic values located within the project area. The study shall also include a description of mitigation measures proposed to minimize the potential adverse effects of the project.

*A Natural Resources Inventory and Forest Stand Delineation (NRI/FSD) was conducted by Rodgers Consulting, Inc. in accordance with the Unified Land Development code of the City of Laurel, MD. This plan delineates, inventories, and describes in detail the forest resources, individual specimen trees with a dbh of 30" or greater, regulated water resources including streams, wetlands, wetland buffers, floodplains, soils, federal and state listed endangered species, historic and cultural resources, and any other environmentally sensitive feature on or within 100 feet of the site. Patuxent Greens Golf Club totals 191.75 acres. The majority of the site is an active golf club located within a 100 year floodplain. In the spring and summer of 2017, Rodgers Consulting delineated six (6) forest stands on the site totaling 67.34 acres. Each stand is identified and described in detail on the approved NRI/FSD. Rodgers Consulting also performed an inventory of all trees with a dbh of 30" or greater as shown on the approved NRI/FSD. The project area was investigated for the possible presence of wetlands by McCarthy and Associates on May 15, 2017. All regulated water resources are shown and described on the approved NRI/FSD. Rodgers Consulting Inc. contacted the Maryland DNR Wildlife and Heritage Service (DNR WHS) on July 28, 2017 to determine if State or Federal listed species occur within the study area. In a letter dated August 23, 2017, the DNR WHS Service determined there are no listed species within the project area. No listed species were observed during any of the site visits. Both, the Maryland Environmental*

*Resource Land Information Network (MERLIN) and PG Atlas show historic and cultural resources are absent from the site.*

*Mitigation measures proposed to minimize potential adverse effects of the property include concentrating development within the area previously developed and actively used as a golf course. To mitigate flood impacts, compensatory storage is being provided in accordance with the requirements of Prince Georges County. A Conditional Letter of Map Revisions has been approved by FEMA and we are actively coordinating with MDE Dam Safety. A forest Conservation Plan has been prepared in accordance with the Unified Land Development code of the City of Laurel, MD that retains forest in excess of all applicable state and local requirements.*

- E. An application to the Administration shall include provisions assuring the maintenance and operation of the proposed project throughout the project's existence.

*Overall maintenance for the site will be the responsibility of the HOA as outlined in the associated HOA documents. A maintenance plan for the Levee will be submitted to MDE for review once the design is finalized. An executed Memorandum of Land Restrictions for Dam or Reservoir has been submitted to MDE for both the property owner (CS Patuxent Greens LLC) and the City of Laurel parcels.*

- F. Unless waived by the Administration, hydrologic calculations shall be based on the ultimate development of the watershed, assuming existing zoning.

*The above referenced calculations have been completed are requested and are included with this submittal package*

- G. Information required by these regulations shall be submitted to the Administration, in a manner and form acceptable to the Administration, before the Administration will take final action on the application.

*Requirements acknowledged*

- H. The Administration shall furnish application forms for permits upon request. The owner of the proposed project or his duly authorized representative shall complete and sign the application form.

*This requirement is acknowledged and has been completed as required.*

- I. When required in writing by the Administration, the applicant shall engage a qualified professional engineer, practicing in accordance with the laws of Maryland, to certify that the design meets all of the requirements of the Administration.

*This requirement is acknowledged and has been completed as required.*

- J. The Administration may refuse to process an application until the applicant has certified in writing to the Administration that all local land use requirements, including zoning, special

exceptions, variances or conditional uses, necessary for the location and operation of the proposed works have been satisfied. It is the applicant's responsibility to obtain State, federal, or local approvals not addressed in the regulations contained in this chapter. Obtaining a permit under this chapter does not relieve the permittee from obtaining other approvals as may be required.

*This requirement is acknowledged and has been completed as required.*

- K. Hydrologic and hydraulic computations shall use methods in the public domain which are verifiable.

*All computations have utilized methods in the public domain which are verifiable*

- L. Unless waived by the Administration, project plans shall include survey and topographic information that is referenced to a bench mark based on the National Geodetic Vertical Datum of 1929 which is incorporated by reference under 41 FR 20202 (1976).

*Completed as required.*

- M. Final action on any application will be deferred pending receipt of an approved sediment and erosion control plan from the local soil conservation district, when the local approval is required under COMAR 26.17.01.

This requirement is acknowledged

- N. An applicant shall agree to allow a reasonable inspection of the proposed project site by representatives of the Administration.

*This requirement is acknowledged*

**H. Tractive Force – COMAR 26.17.04.07(B)**

Per COMAR, *proposed unlined channels may not change the tractive force with the 2-yr and the 10-yr frequency flood events, by more than 10 %, throughout their length unless it can be determined that the channel will remain stable.* The tractive force (shear stress) within the channel has been measured for the 10 yr. storm event and there were a total of 3 sections that had an increase of greater than 10%. The sections currently in review are 196568.8 with a tractive force of 0.39 lb/ft<sup>2</sup>, 196356.8 with a tractive force of 0.39 lb/ft<sup>2</sup>, and 195583.1 with a tractive force of 0.18 lb/ft<sup>2</sup>. The shear stress for all sections that see an increase the channel shear stress still remained below the 2 lb/ft<sup>2</sup> threshold required for stream channel matting (per the 2011 MDE Standards and Specifications for Soil Erosion and Sediment Control Manual page B.36 detail B-4-6 Standards and specifications for Soil Stabilization Matting) the overall increase was more than the 10% allowable. Velocities through all sections that saw an increase over 10% were still low enough to be considered non-erosive. Further coordination with MDE and additional field investigation will be required to investigate channel stability.



**I. Proposed Housing First Floor Elevations**

Per City and State code, the first floor elevation of any building must be constructed 2’ above the base flood elevation. The developer has gone above and beyond this requirement for the development by raising the site to bring the first floor elevations between 4-6’ above the base flood elevations. Also, within the proposed developable area the finished grade of the entire site will be graded to a minimum of 2’ above the base flood elevations.

**J. Summary Table**

The below table compares the water surface elevations at each section thru the floodplain (floodplain sections located in appendix). In the original FEMA model the berm that surrounds the golf course was not taken into effect when modeling the floodplain. In order to show the effects that the berm has on the existing floodplain it was added to the existing conditions model Column “B”. Column A depicts the 100-yr. flood elevations of the existing conditions floodplain model without the effect of the berm around the golf course, and column “C” depicts the 100-yr. floodplain elevation after the construction of the proposed development. The following columns (C-A & C-B) show the amount the 100-yr. floodplain will decrease with the proposed development.

<b>WSEL TABLE (FT.) (NAVD88)</b>					
<b>X SEC</b>	<b>A</b> Existing without Berm	<b>B</b> Existing with Berm	<b>C</b> Proposed	<b>C-A</b>	<b>C-B</b>
201119	134.30	134.30	134.30	0.00	0.00
201058.7	134.19	134.15	134.16	-0.03	0.01
200115.4	133.07	132.99	133.02	-0.05	0.03
198588.0	129.80	129.98	129.85	0.05	-0.13
197599.6	128.17	129.03	128.24	0.07	-0.79
196568.8	125.75	128.17	125.48	-0.27	-2.69
196356.8	124.64	128.13	124.52	-0.12	-3.61
195583.1	122.91	127.97	123.62	0.71	-4.35
194817.8	122.40	127.94	123.10	0.70	-4.84
193854.4	122.14	127.47	122.46	0.32	-5.01
193357.9	121.97	123.97	121.56	-0.41	-2.41
193176.6	121.85	122.59	121.64	-0.21	-0.95
192867	121.47	121.47	121.50	0.03	0.03
192774.7	121.35	121.35	121.36	0.01	0.01
192514.9	120.93	120.93	120.93	0.00	0.00
191681.5	120.22	120.22	120.22	0.00	0.00
190879.0	119.93	119.93	119.93	0.00	0.00

**K. Hec-Ras Warning Messages**

Per definition in the Hec-Ras Manual -Warning messages provide information to the user that may or may not require action on the user’s part. In general, whenever a warning is at a set location, the user should review the hydraulic results at that location to ensure that the results are reasonable. If hydraulic results are found to be reasonable then the message can be ignored. It is important to note that the user does not have to eliminate all warning messages.

In almost all instances the warning messages listed below were seen in both the existing and proposed sections of the models. Throughout iterations of this Hec-Ras analysis, six additional

cross sections (196568.8, 194817.8, 193357.9, 193176.6, 192774.7, 192867.0) were added beyond the number of cross sections modeled from FEMA's study per MDE requests to further refine the results of the floodplain model and in an attempt to remove some of the below warning messages. This produced no impact in the amount of error messages with little to no effect on the floodplain elevations. Therefore, no additional or interpolated cross sections were included in the analysis beyond these.

Hec-Ras warning messages include

- Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth. This warning issued when a subcritical flow analysis is being performed but the program could not determine a subcritical flow depth at the specified cross section. As the program is attempting to determine the upstream depth, it is using an iterative technique to solve the energy equation. During the iterations, the program tried critical depth as a possible solution, which resulted in a flow depth less than critical. Since this is not possible in a subcritical analysis, the program defaulted to using critical depth at this cross section and continued on with the analysis. This error is often associated with too long of a reach length between cross sections or misrepresentation of the effective flow area of the cross section.

Proposed conditions sections present: 201119: This warning message occurs across all models in the existing and proposed conditions and is at the tie in to the FEMA model. Therefore it was not determined to have a significant effect on the floodplain delineation.

Existing W/O Berm sections present: 201119

Existing with Berm sections present: 201119, 193357.9, 193176.6 this warning message for sections 193357.9 & 193176.6 occurred after adding the new section to the compensatory storage area. This was most likely caused by the reduction in flow area caused by this section being added since its elevation is significantly higher than the other sections and mostly above the 116.00 used for ineffective flow. Increasing the ineffective flow area may correct this error.

- Warning – The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface elevations and continued on with the calculations. This warning indicates the possible need for additional cross sections. This is due to the fact that the rate of energy loss is not linear. However, the program uses, as a default, an average conveyance equation to determine energy loss. Therefore, if the cross sections are too far apart, the appropriate energy loss will not be determined at all cross sections.

Proposed conditions sections present: 201119, 196356.8: As mentioned

above, additional cross sections have been added to the model to refine the results with no significant impacts to the floodplain.

Existing W/O Berm sections present: 201119

Existing with Berm sections present: 201119, 193357.9, 193176.6

- Warning – The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross sections. This may indicate the need for additional sections. This warning indicates the possible need for additional cross sections. This is due to the fact that the rate of energy loss is not linear. However, the program uses, as a default, an average conveyance equation to determine energy loss. Therefore, if the cross sections are too far apart, the appropriate energy loss will not be determined at all cross sections.

Proposed conditions sections present: 201058.7, 200115.4, 198588.0, 197599.6, 196568.8, 196356.8: As mentioned above, additional cross sections have been added to the model to refine the results with no significant impacts to the floodplain.

Existing W/O Berm sections present: 201058.7, 200115.4, 198588.0, 197599.6, 196356.8, 192514.9

Existing with Berm sections present: 201058.7, 200115.4, 198588.0, 197599.6, 193854.4, 193357.9, 193176.6,

- Warning – The velocity head has changed by more than 0.5ft (0.15 m) this may indicate the need for additional cross sections. This warning indicates the possible need for additional cross sections. To explain this message, it is important to note that for subcritical flow analysis, the program starts at the downstream end of the reach and works its way upstream. The change in velocity could be reflecting the fact that the shape of the cross section is changing dramatically and causing the flow area to be contracting or expanding, or that significant change in slope occurred.

Proposed conditions sections present: 196356.8: As mentioned above, additional cross sections have been added to the model to refine the results with no significant impacts to the floodplain.

Existing W/O Berm sections present:

Existing with Berm sections present: 193854.4, 193357.9

- Warning – Divided flow computed for this cross section. After the flow depth was calculated for the cross section, the program determined that the flow was occurring in more than one portion of the cross section.

Proposed conditions sections present: 201119, 201058.7, 200115.4, 197599.6, 193176.6, 192867, 192514.9, 191681.5: The divided flow in

sections 201058.7-197599.6 are caused by the impacts of the large raised park in between the confluences of the Patuxent and Bear Branch Rivers, while the Divided flow in sections 196356.8 – 191681.5 are caused by the flows thru the compensatory storage area.

Existing W/O Berm sections present: 201119, 201058.7, 200115.4, 197599.6, 196568.8, 196356.8, 195583.1, 194817.8, 193854.4, 193357.9, 193176.6, 192867, 192514.9, 191681.5

Existing with Berm sections present: 201119, 201058.7, 200115.4, 198588.0, 197599.6, 193176.6, 192867, 192514.9,

- Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections. The conveyance of the cross section, K, is defined by:

$$K = \frac{1.486AR^{2/3}}{n}$$

If the n values for two subsequent cross sections are approximately the same, it can be seen that the ratio of the two conveyances is primarily a function of the cross sectional area. If this ratio differs by more than 30%, then this warning will be issued. This warning implies that the cross sectional areas are changing dramatically between the two sections and additional cross sections should be supplied for the program to be able to more accurately compute the water surface elevation.

Proposed conditions sections present: 197599.6, 196356.8, 193357.9, 192867, 192514.9: As mentioned above, additional cross sections have been added to the model to refine the results with no significant impacts to the floodplain.

Existing W/O Berm sections present: 197599.9, 196356.8, 195583.1, 193176.6, 192514.6, 191681.5

Existing with Berm sections present: 198588.0, 196568.8, 195583.1, 194817.8, 193854.4, 193357.9, 193176.6, 192514.9, 191681.5

## L. Conclusion

This floodplain study delineates the 100-year proposed floodplain impacting the Patuxent Greens site. FEMA's cross sections were utilized in providing supporting information to effectively delineate the new 100-year floodplain. The table below summarizes the Manning's Roughness Coefficient's used and the resulting 100-Yr Water surface elevation at each cross-section. All River stations match through all Hec-Ras Models

**River Station Summary (Manning's Coefficient and 100-Yr WSEL)**

<b>Model A = Existing Condition with Berm</b>
<b>Model B = Existing Condition without Berm</b>
<b>Model C = Proposed Condition</b>

Cross Section #	On-Site or Off-Site	Difference in 100-Yr WSEL	
		Model C-Model A	Model C-Model B
201119	OFF	0.0	0.0
201058.7	OFF	0.0	0.0
200115.4	OFF	0.0	0.0
198588.0	ON	0.0	-0.1
197559.6	ON	0.1	-0.8
196568.8	ON	-0.3	-2.7
196356.8	ON	-0.1	-3.6
195583.1	ON	0.7	-4.3
194817.8	ON	0.7	-4.8
193854.4	ON	0.3	-5.0
193357.9	ON	-0.4	-2.4
193176.6	ON	-0.2	-1.0
192867.0	ON	0.0	0.0
192774.7	ON	0.0	0.0
192514.9	OFF	0.0	0.0
2191681.5	OFF	0.0	0.0
190879.0	OFF	0.0	0.0

Cross Section #	On-Site or Off-Site	Existing Without Berm (Model A)			100-Yr WSEL
		Manning's Runoff Coefficient			
		Anne Arundel County	Patuxent River	City of Laurel	
201119	OFF	0.1	0.03	0.1	134.3
201058.7	OFF	0.1	0.035	0.1	134.2
200115.4	OFF	0.1	0.035	0.1	133.1
198588.0	ON	0.1	0.035	0.08	129.8
197559.6	ON	0.04,0.1	0.035	0.08,0.035,0.05	128.2
196568.8	ON	0.1	0.035	0.08,0.035,0.055	125.8
196356.8	ON	0.1	0.035	0.08,0.035,0.055	124.6
195583.1	ON	0.1	0.035	0.08,0.035,0.055	122.9
194817.8	ON	0.1	0.035	0.08,0.035,0.055	122.4
193854.4	ON	0.1	0.035	0.08,0.055	122.1
193357.9	ON	0.1	0.03	0.055	122.0
193176.6	ON	0.1	0.035	0.055	121.9
192867.0	ON	0.1	0.035	0.055	121.5
192774.7	ON	0.1	0.035	0.08	121.4
192514.9	OFF	0.1	0.035	0.1	120.9
2191681.5	OFF	0.1	0.03	0.1	120.2
190879.0	OFF	0.1	0.03	0.1	119.9

Cross Section #	On-Site or Off-Site	Existing with Berm (Model B)			100-Yr WSEL
		Manning's Runoff Coefficient			
		Anne Arundel County	Patuxent River	City of Laurel	
201119	OFF	0.1	0.03	0.1	134.3
201058.7	OFF	0.1	0.035	0.1	134.2
200115.4	OFF	0.1	0.035	0.1	133.0
198588.0	ON	0.1	0.035	0.08	130.0
197559.6	ON	.04,.1	0.035	0.08,0.035,0.05	129.0
196568.8	ON	0.1	0.035	0.08,0.035,0.055	128.2
196356.8	ON	0.1	0.035	0.08,0.035,0.055	128.1
195583.1	ON	0.1	0.035	0.08,0.035,0.055	128.0
194817.8	ON	0.1	0.035	0.08,0.035,0.055	127.9
193854.4	ON	0.1	0.035	0.08,0.055	127.5
193357.9	ON	0.1	0.03	0.055	124.0
193176.6	ON	0.1	0.035	0.055	122.6
192867.0	ON	0.1	0.035	0.055	121.5
192774.7	ON	0.1	0.035	0.08	121.4
192514.9	OFF	0.1	0.035	0.1	120.9
2191681.5	OFF	0.1	0.03	0.1	120.2
190879.0	OFF	0.1	0.03	0.1	119.9

Cross Section #	On-Site or Off-Site	Proposed (Model C)			100-Yr WSEL
		Manning's Runoff Coefficient			
		Anne Arundel County	Patuxent River	City of Laurel	
201119	OFF	0.1	0.03	0.1	134.3
201058.7	OFF	0.1	0.035	0.1	134.2
200115.4	OFF	0.1	0.035	0.1	133.0
198588.0	ON	0.1	0.035	0.08	129.9
197559.6	ON	.04,0.1	0.035	0.08,0.035,0.05	128.2
196568.8	ON	0.1	0.035	0.08,0.035,0.055	125.5
196356.8	ON	0.1	0.035	0.08,0.035,0.055	124.5
195583.1	ON	0.1	0.035	0.08,0.035,0.055	123.6
194817.8	ON	0.1	0.035	0.08,0.035,0.055	123.1
193854.4	ON	0.1	0.035	0.055	122.5
193357.9	ON	0.1	0.03	0.055	121.6
193176.6	ON	0.1	0.035	0.055	121.6
192867.0	ON	0.1	0.035	0.055	121.5
192774.7	ON	0.1	0.035	0.08	121.4
192514.9	OFF	0.1	0.035	0.1	120.9
2191681.5	OFF	0.1	0.03	0.1	120.2
190879.0	OFF	0.1	0.03	0.1	119.9

\* All River stations match through all Hec-Ras Models



# Appendix

## **Appendix A**

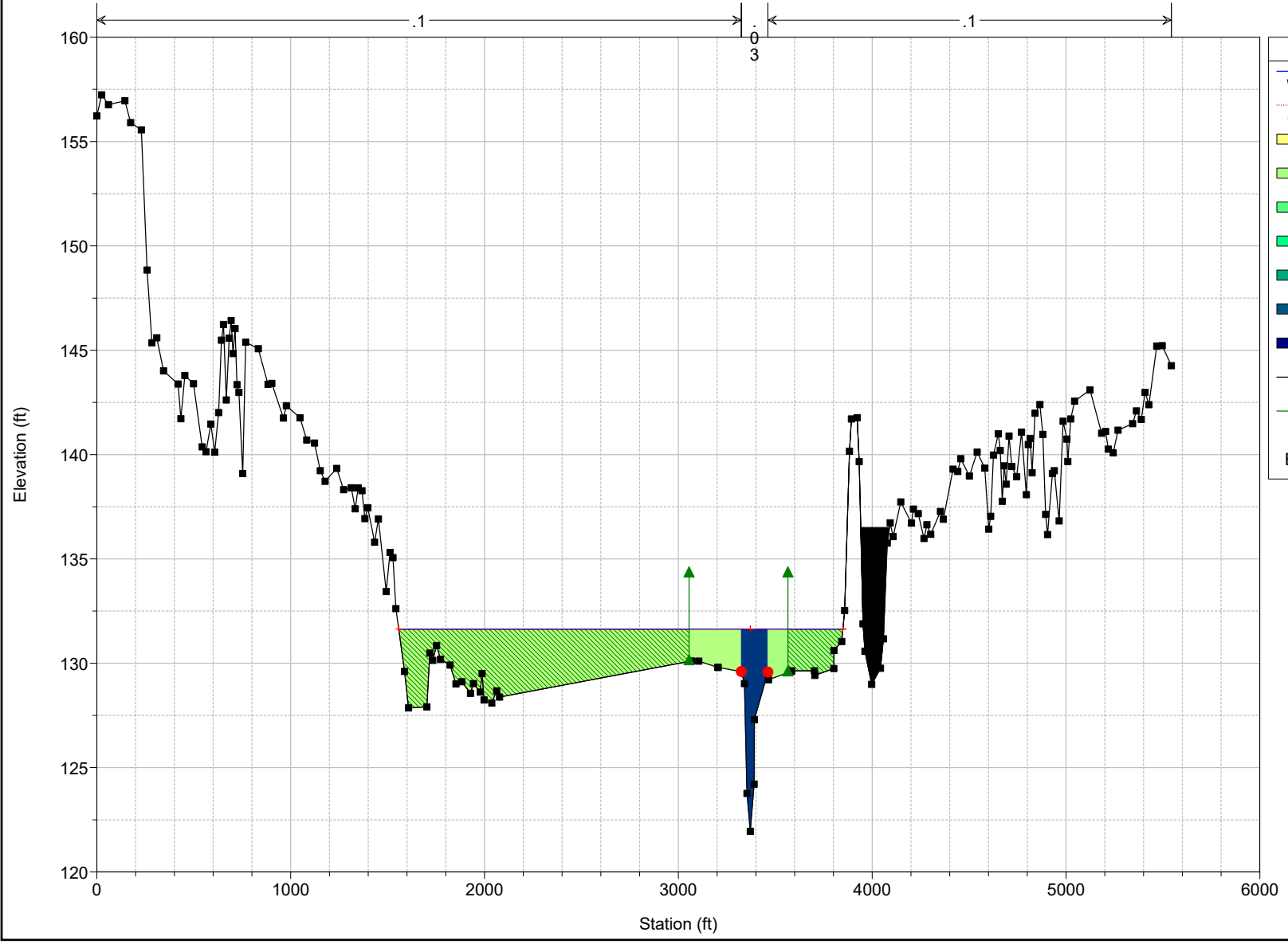
### **Existing 10-yr Storm Cross Sections with Velocity**

## **Existing 10-yr Storm Cross Sections with Velocity**

**(Without Berm)**

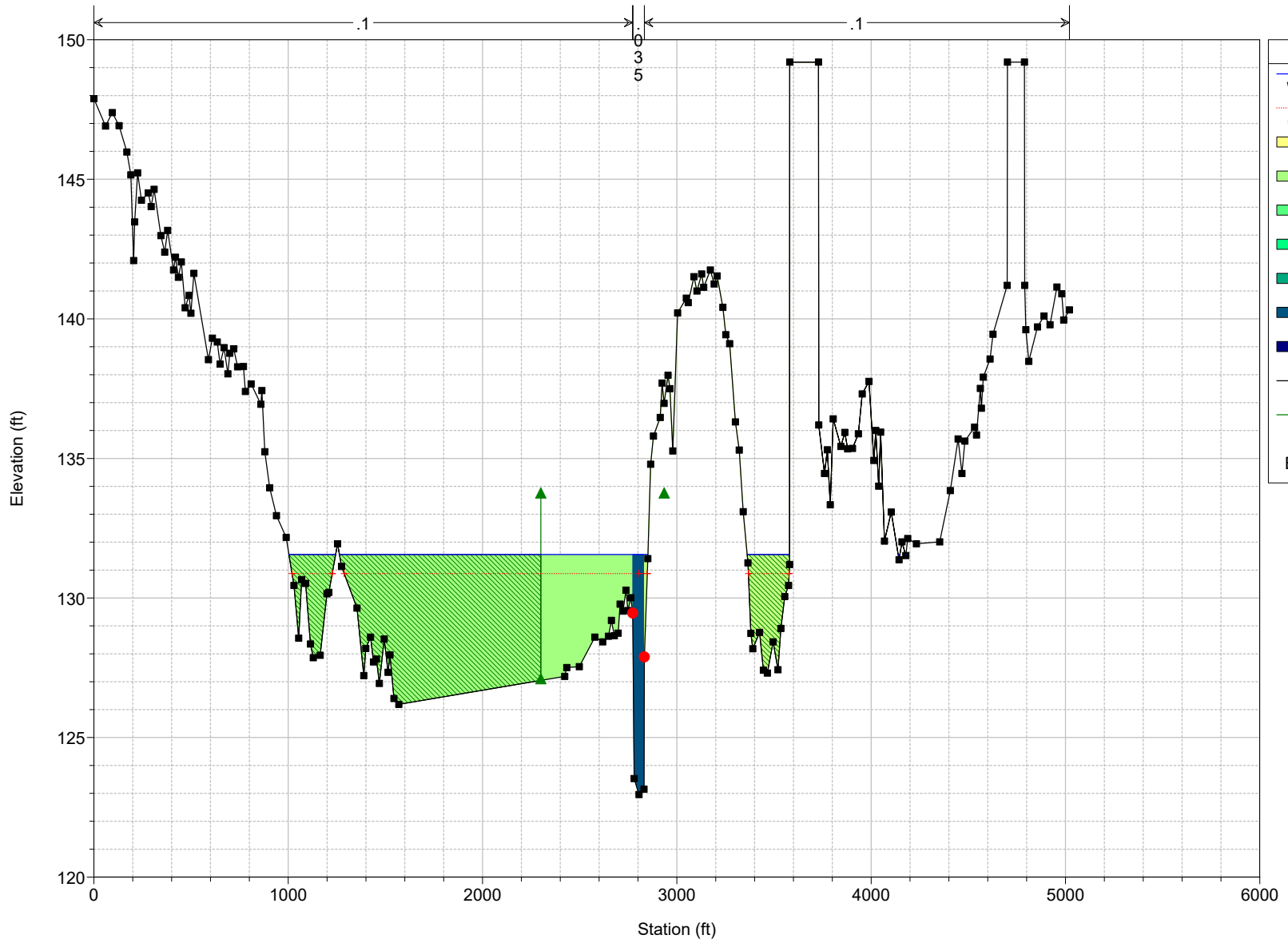
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

RS = 201119



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

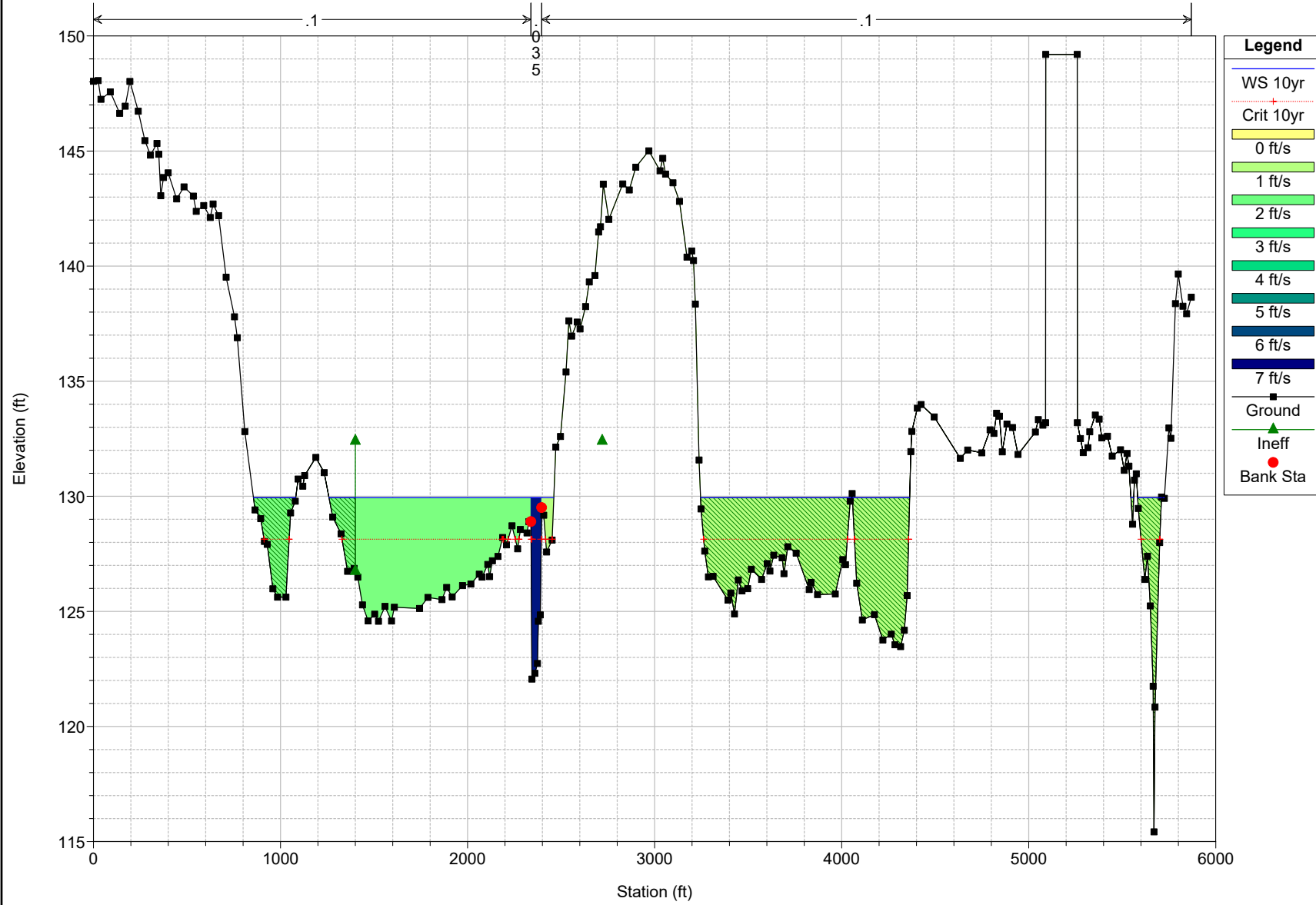
RS = 201058.7



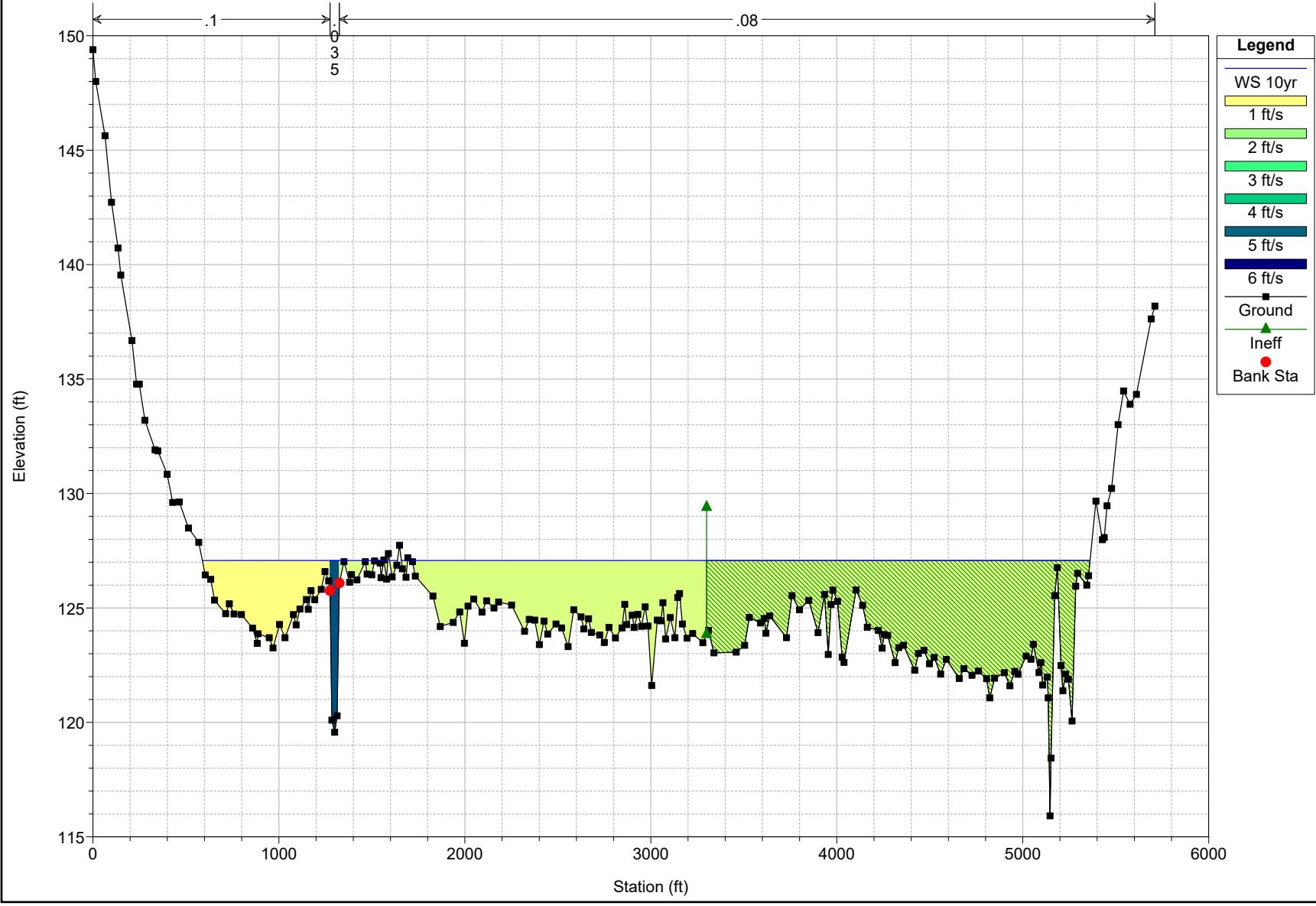
**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- 12 ft/s
- Ground
- Ineff
- Bank Sta

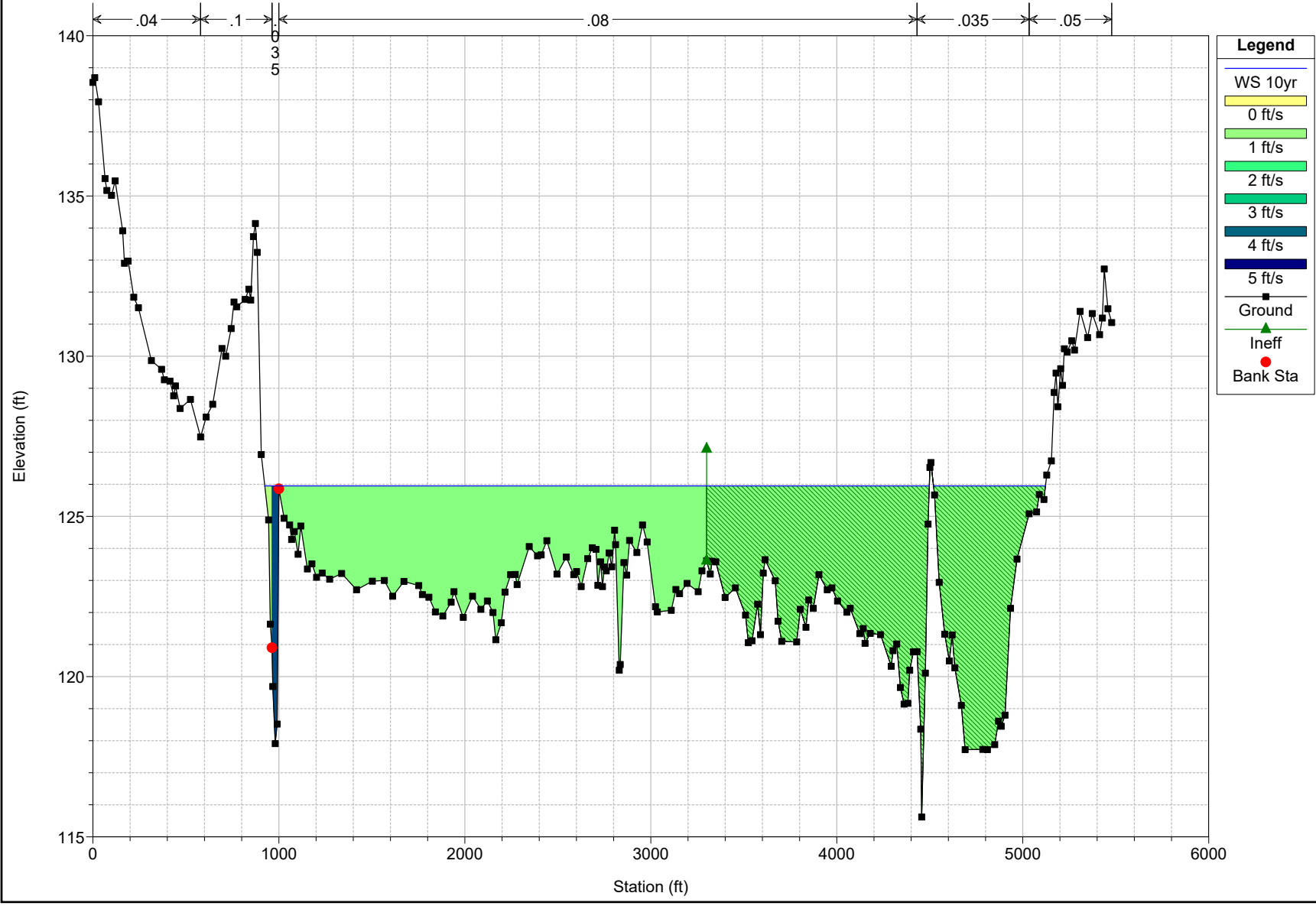
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 200115.4



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 198588.0

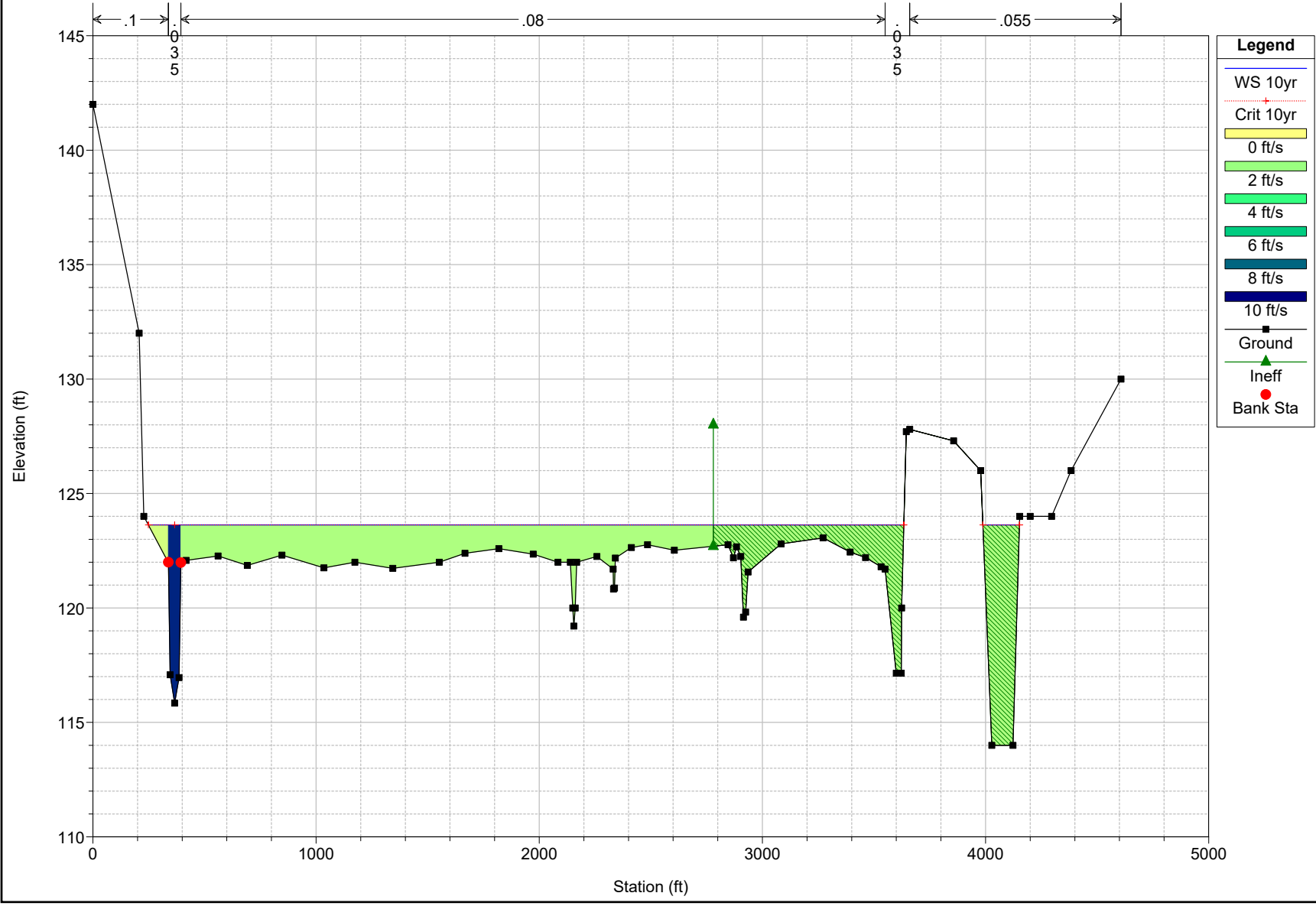


Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 197599.6

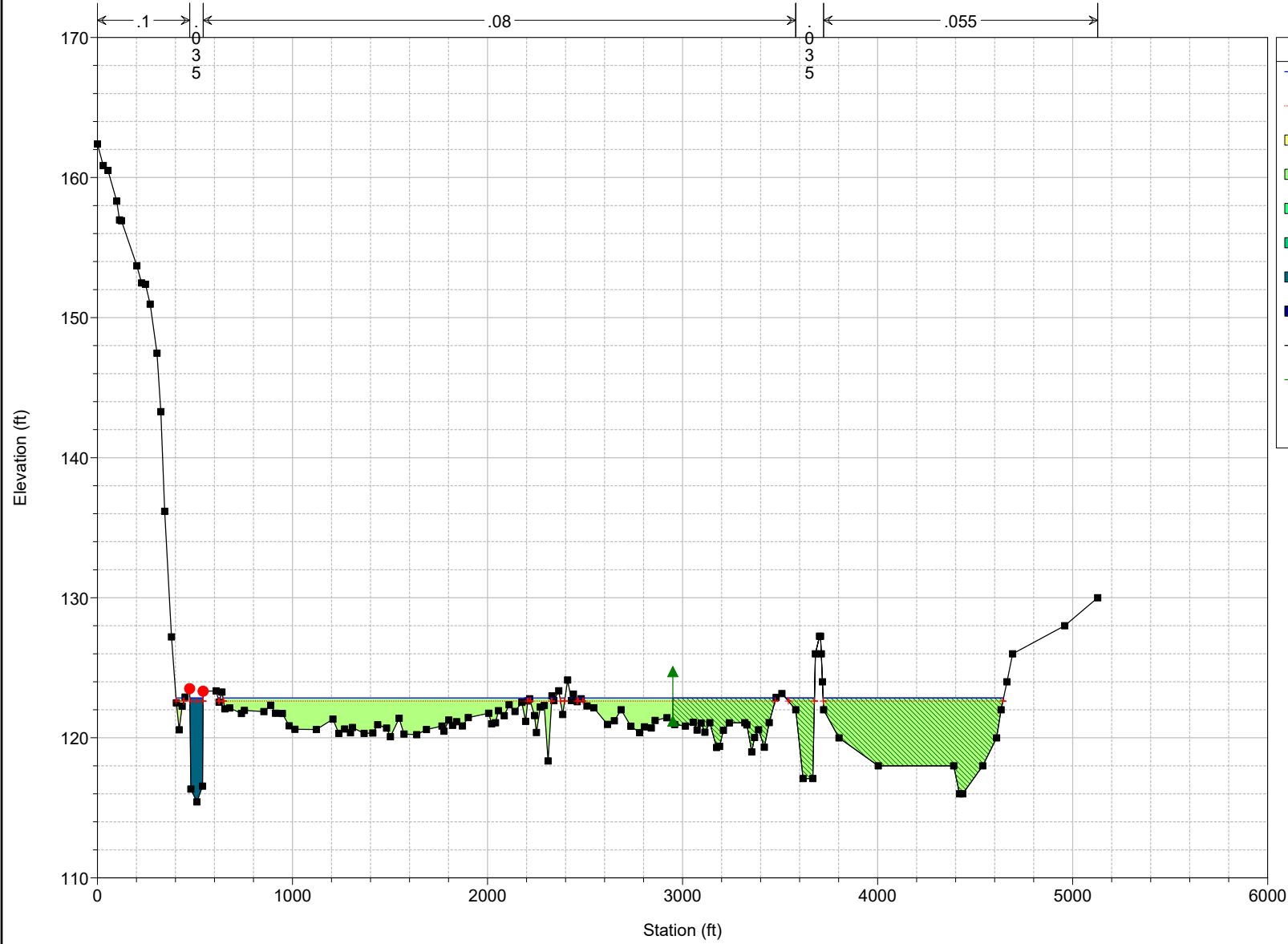




Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 196568.8



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 196356.8

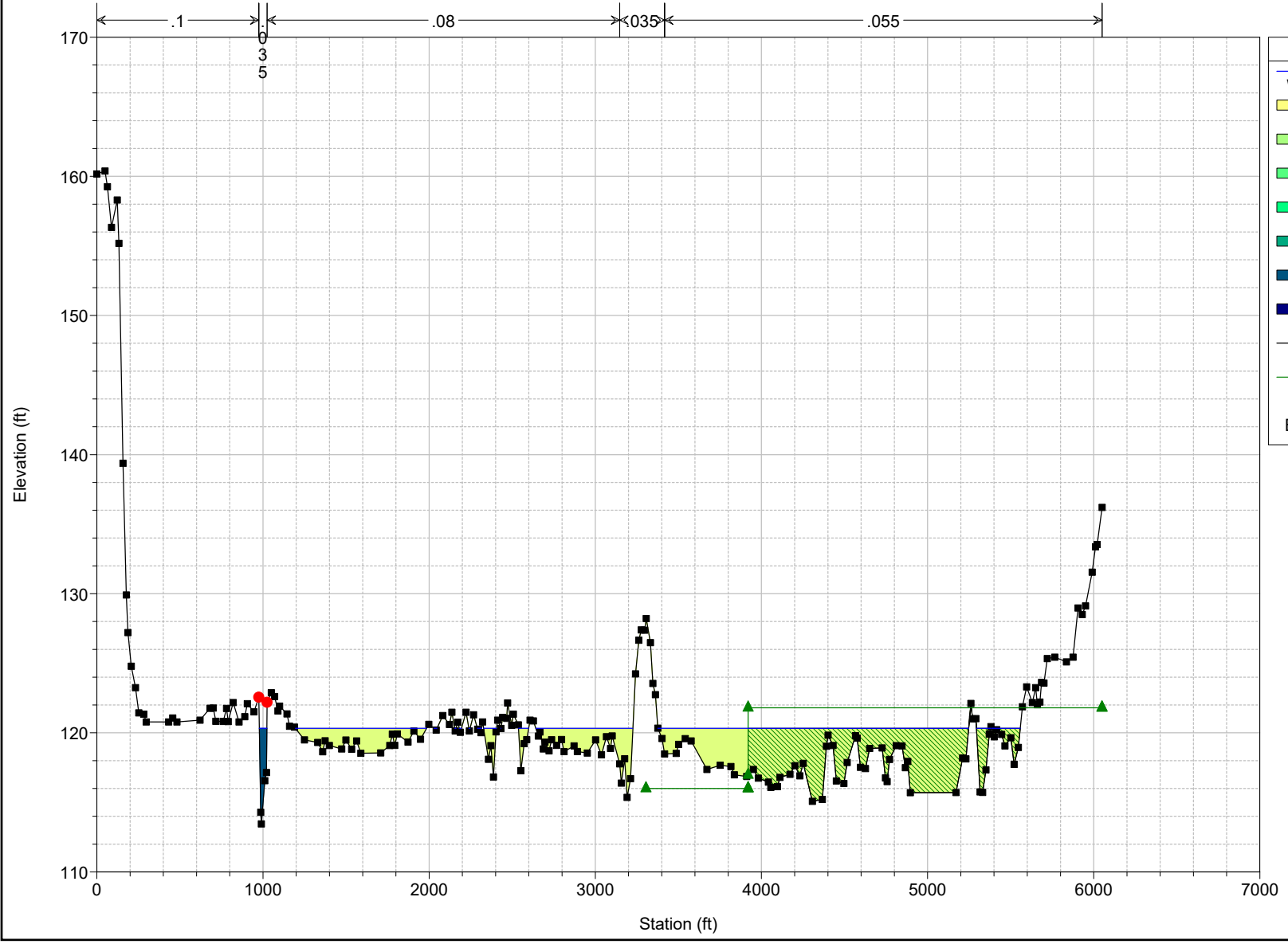


**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

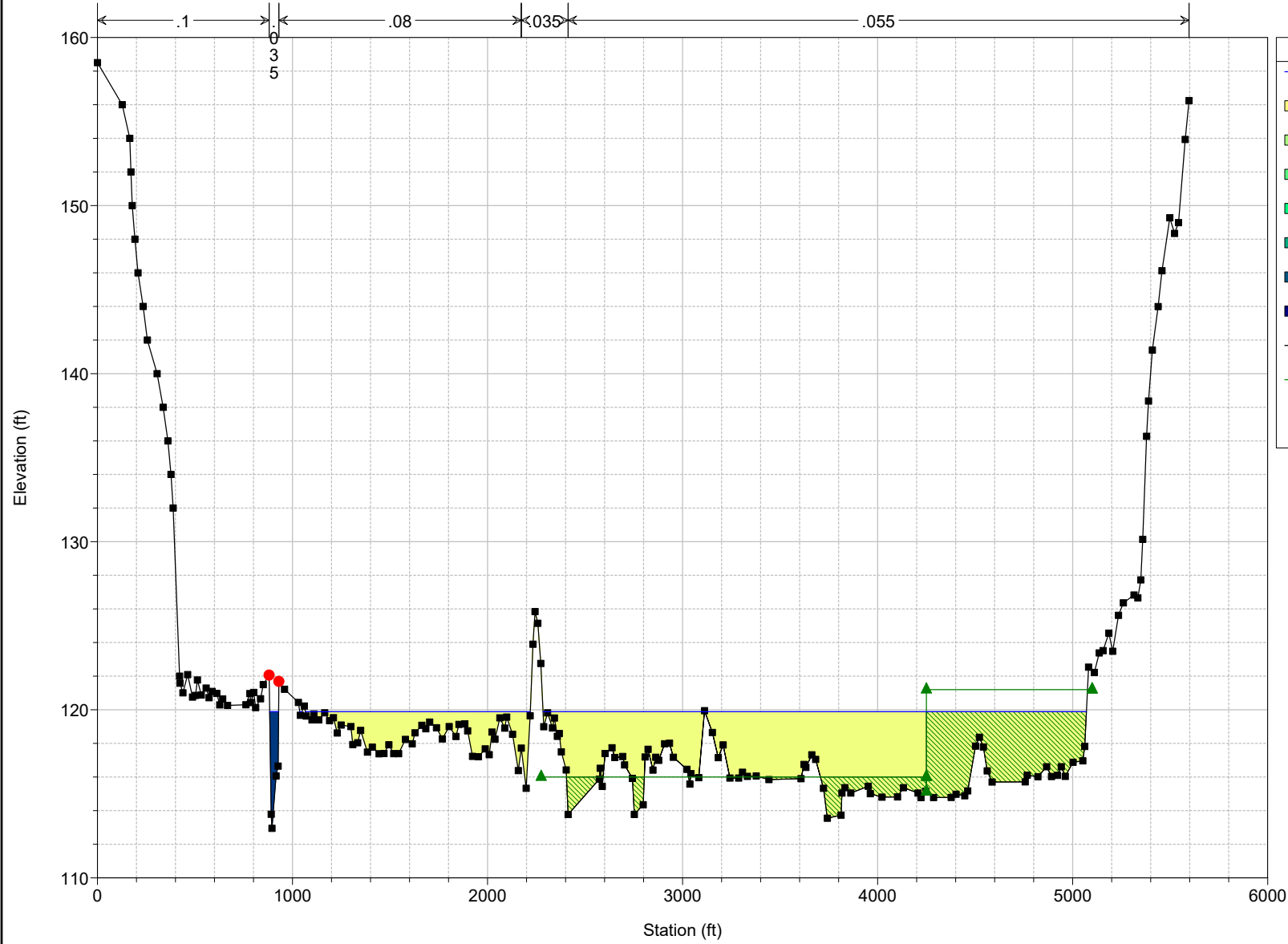
RS = 195583.1



**Legend**

- WS 10yr
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- 8 ft/s
- Ground
- Ineff
- Bank Sta

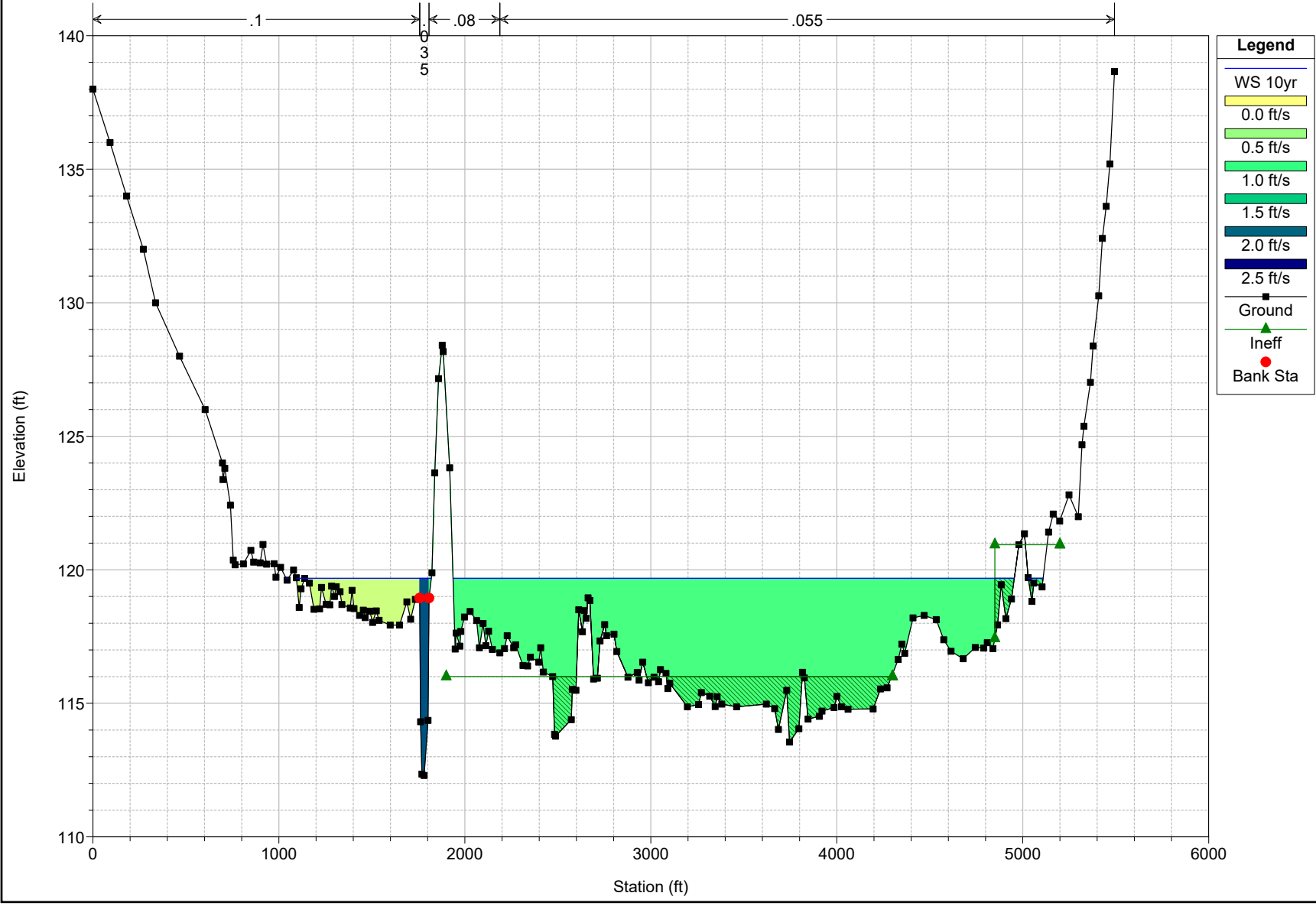
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 194817.8



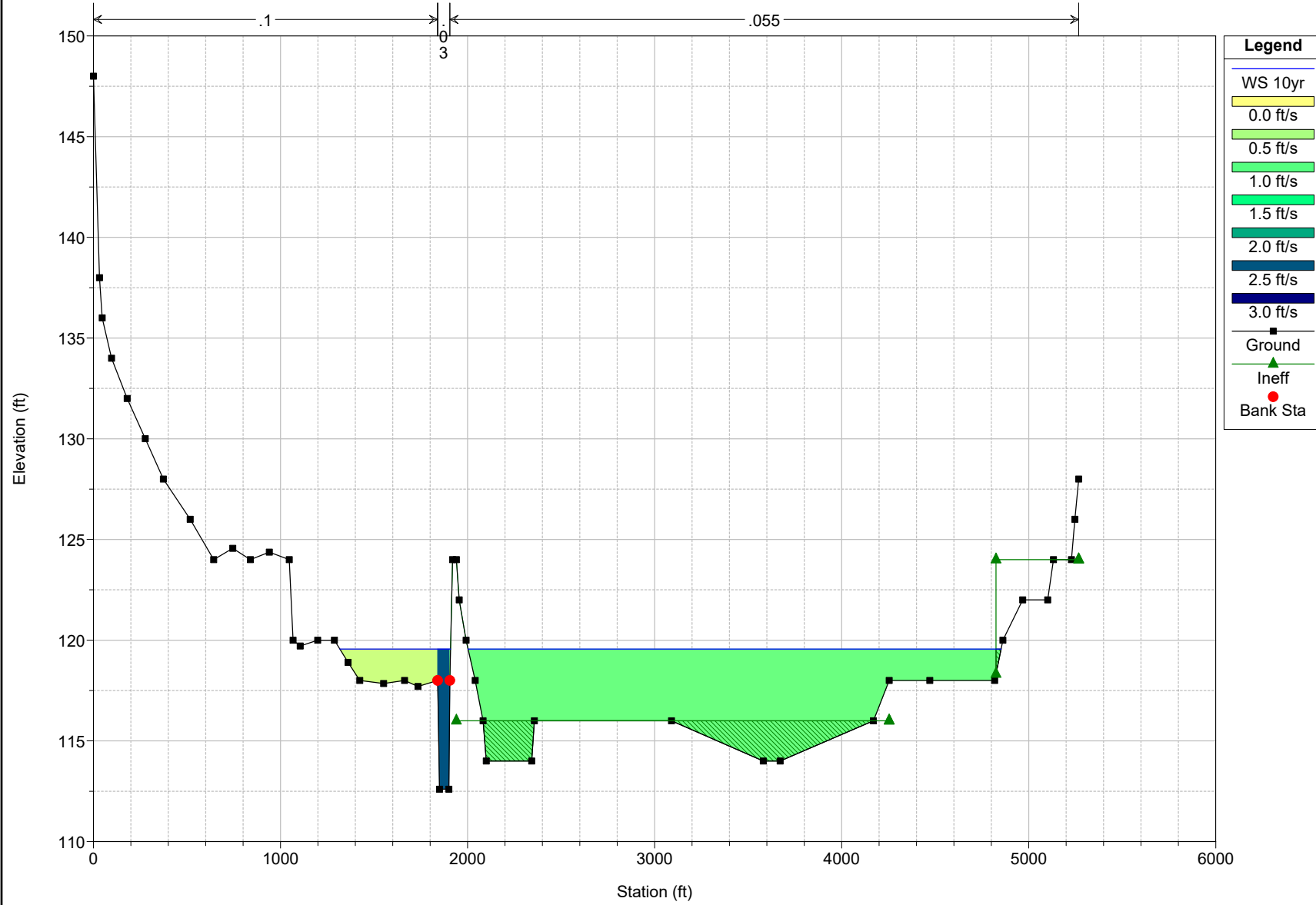
**Legend**

- WS 10yr
- 1.0 ft/s
- 1.2 ft/s
- 1.4 ft/s
- 1.6 ft/s
- 1.8 ft/s
- 2.0 ft/s
- 2.2 ft/s
- Ground
- Ineff
- Bank Sta

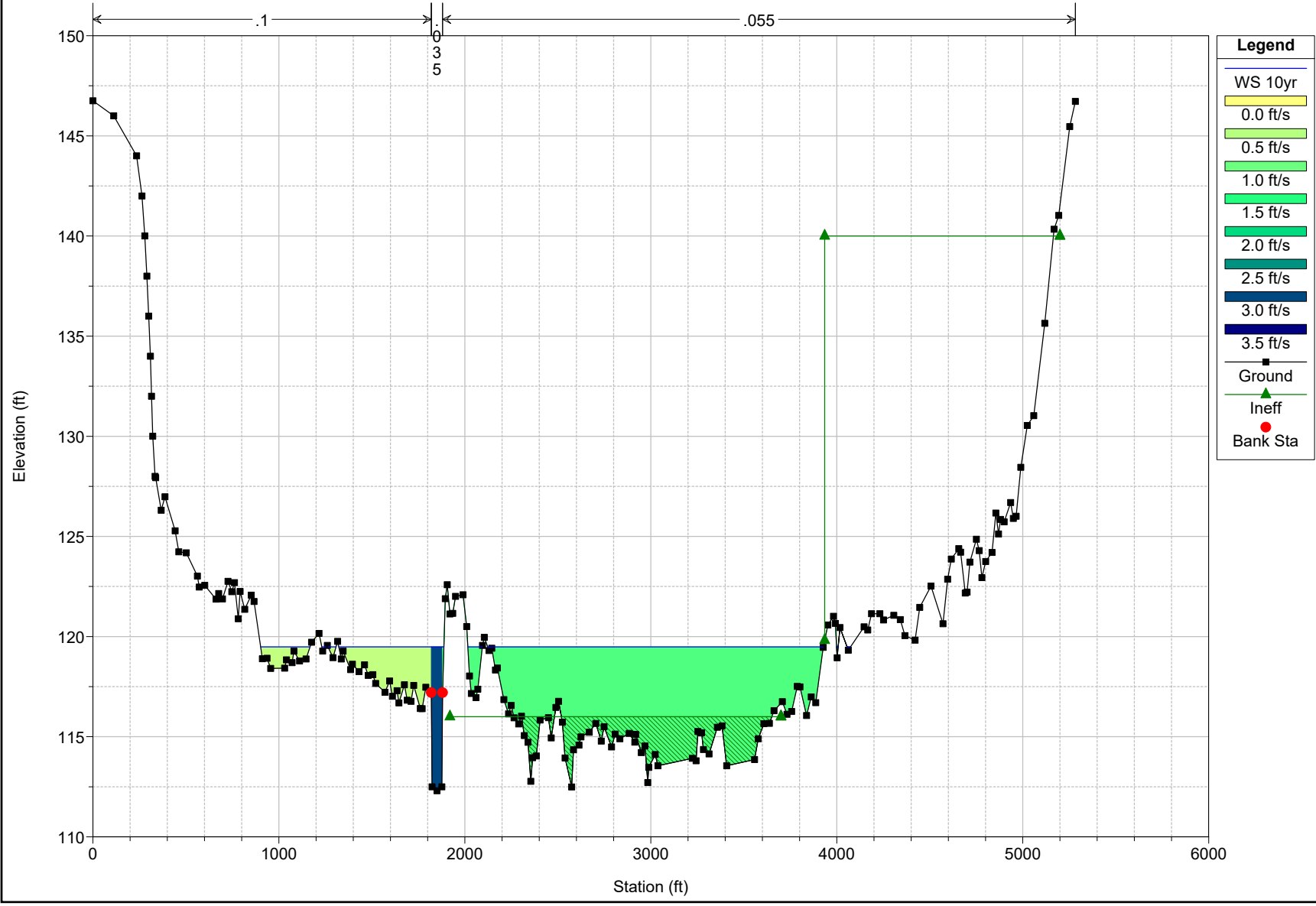
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 193854.4



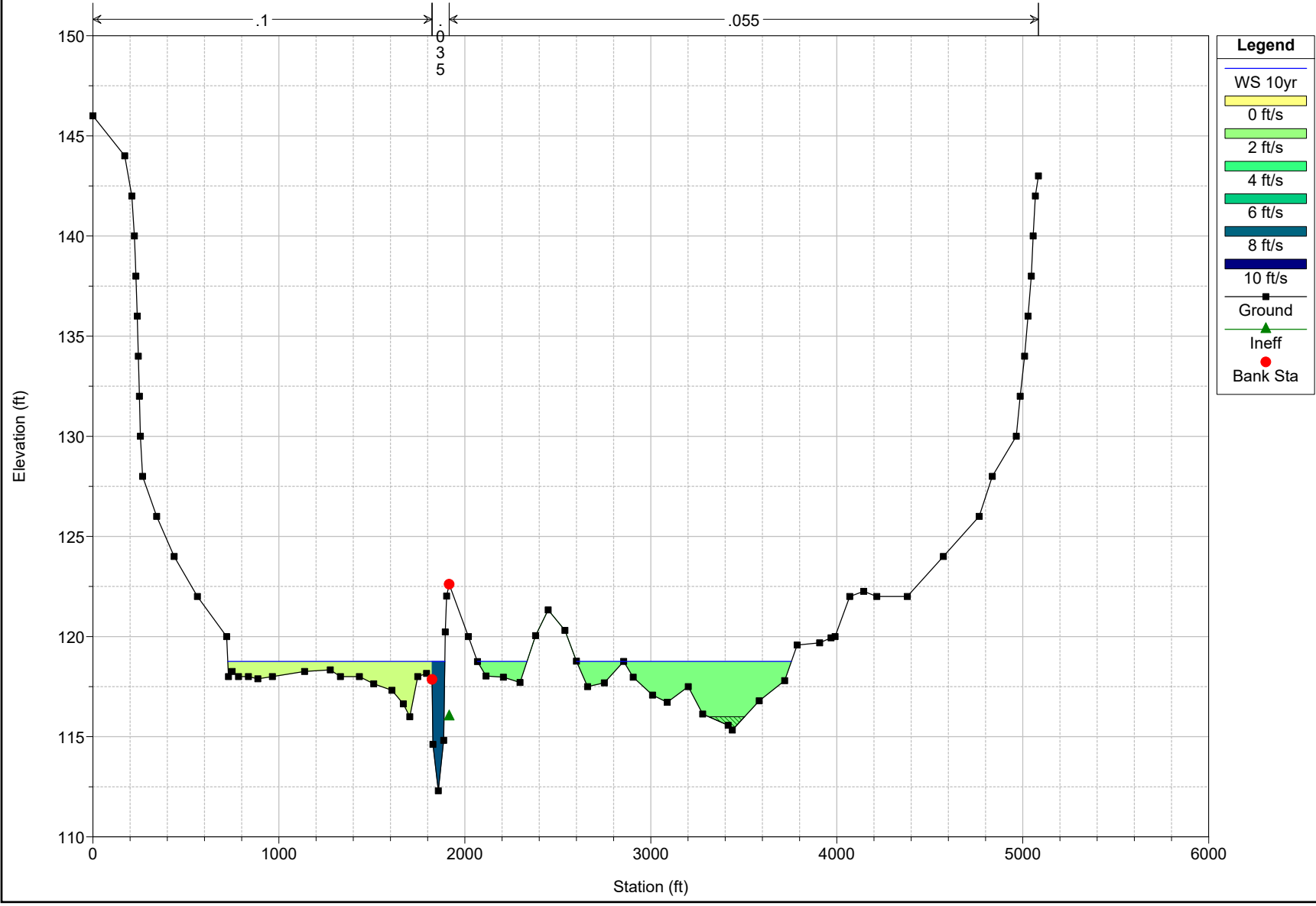
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 193357.9



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 193176.6

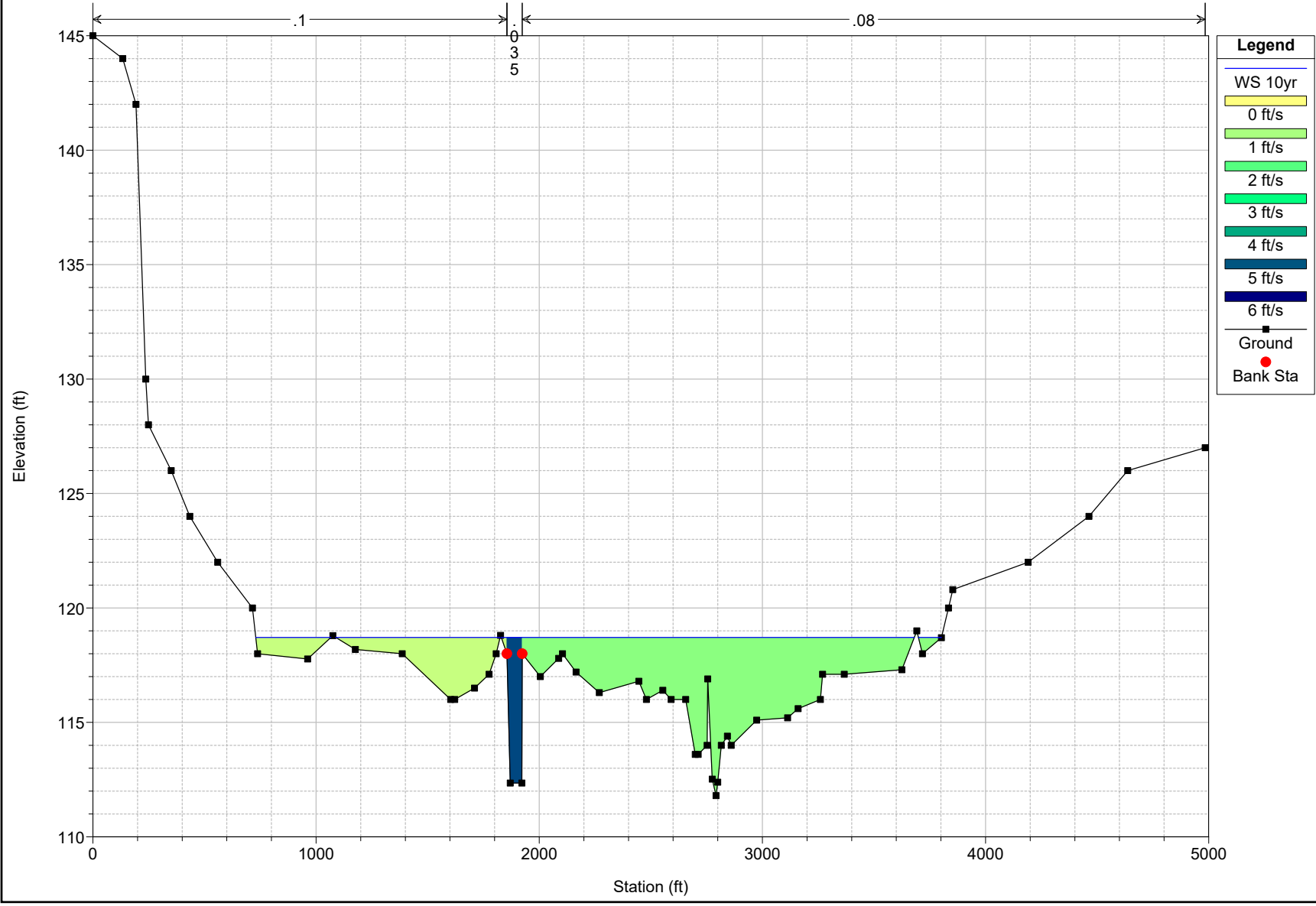


Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 192867

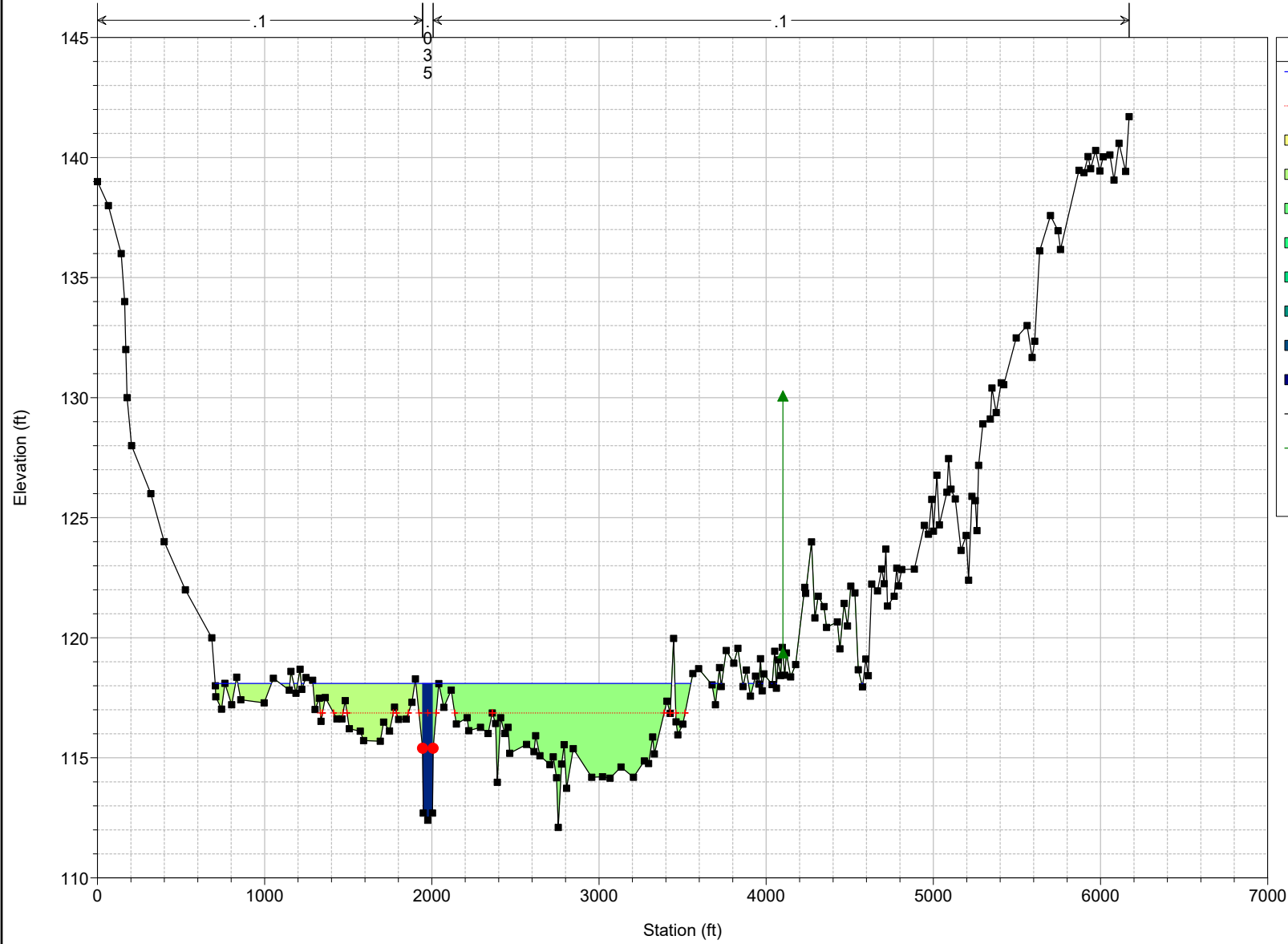




Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 192774.7



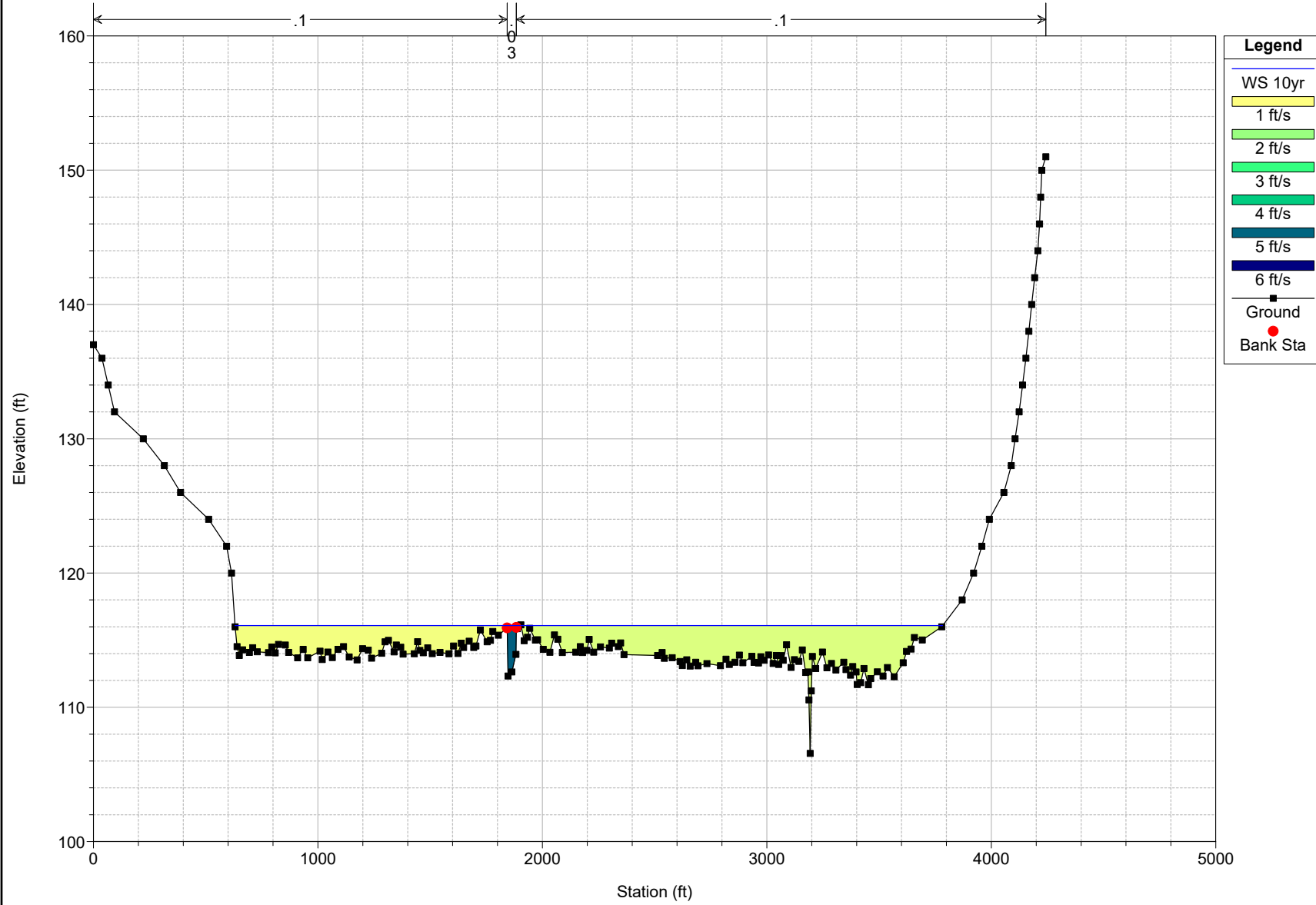
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 192514.9



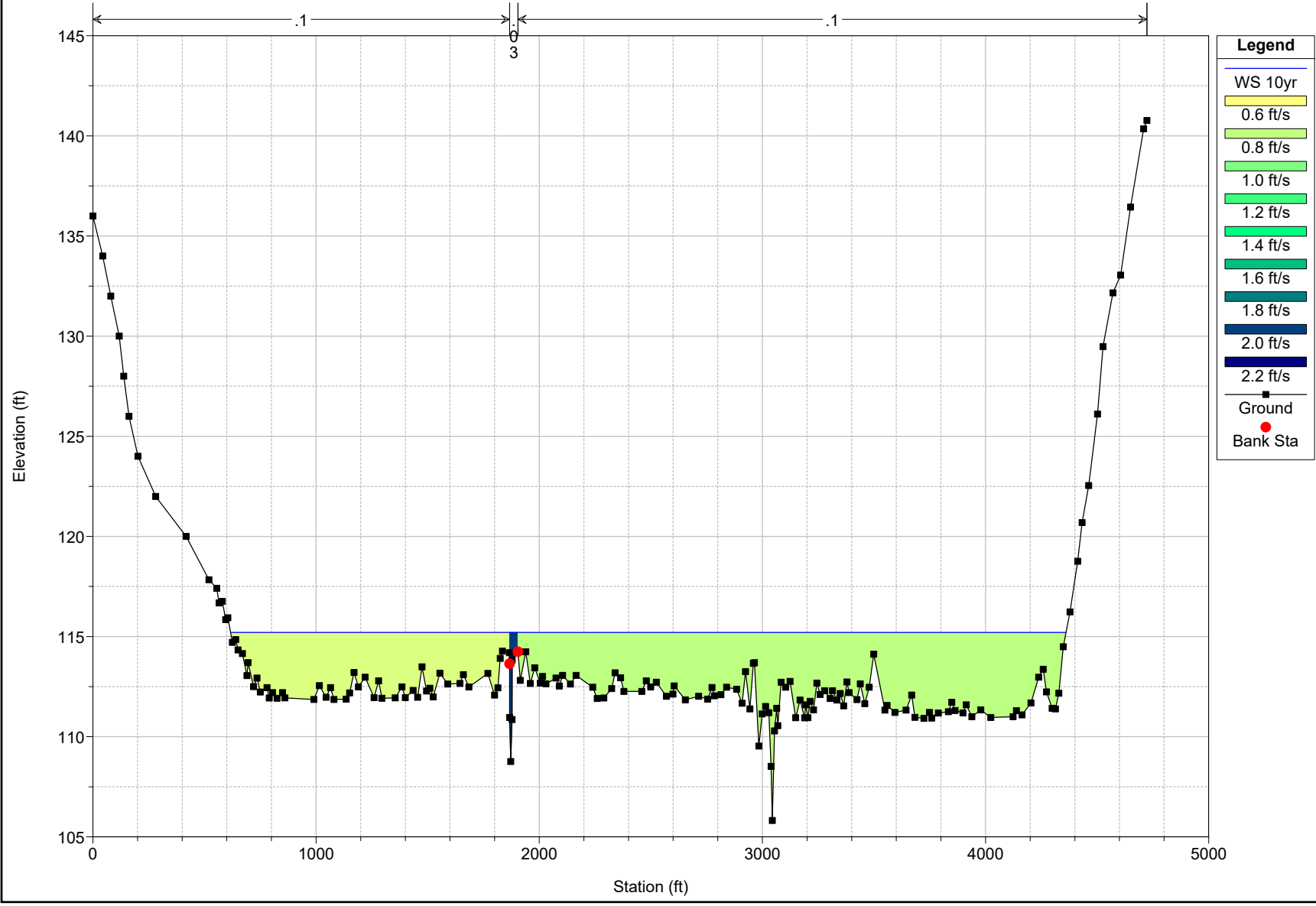
**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 191681.5



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 190879.0

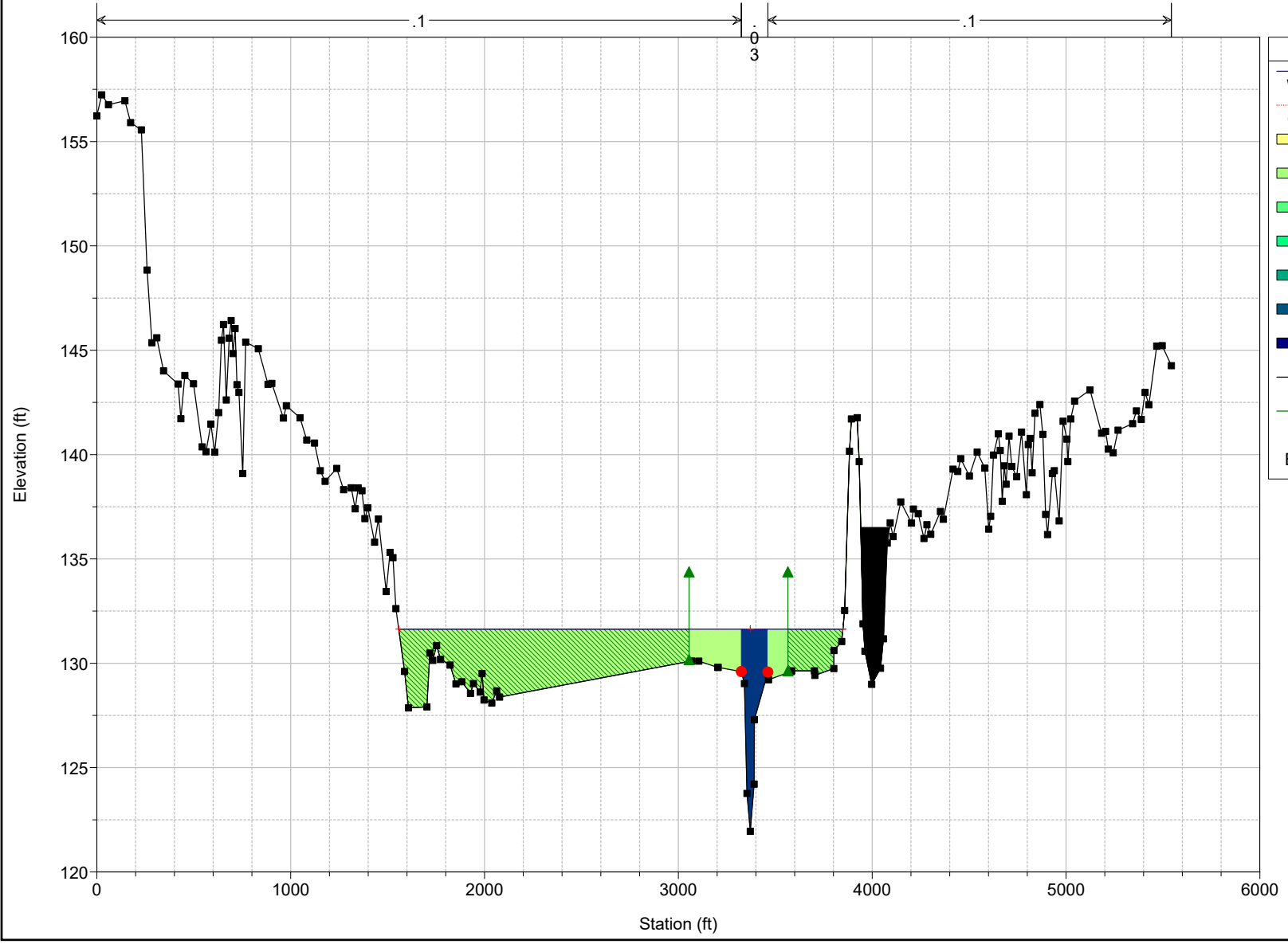


## **Existing 10-yr Storm Cross Sections with Velocity**

**(With Berm)**

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

RS = 201119

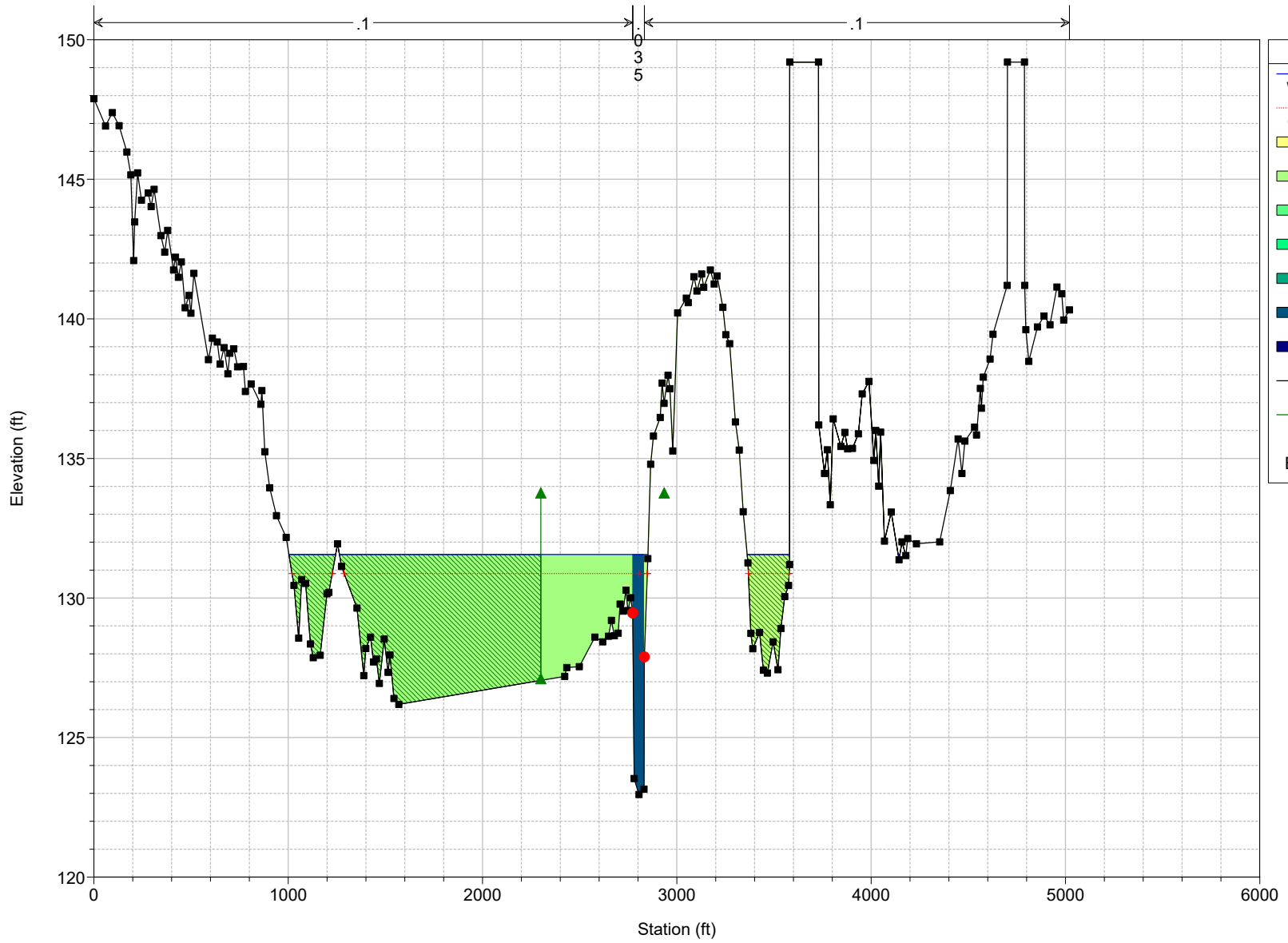


**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- 12 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

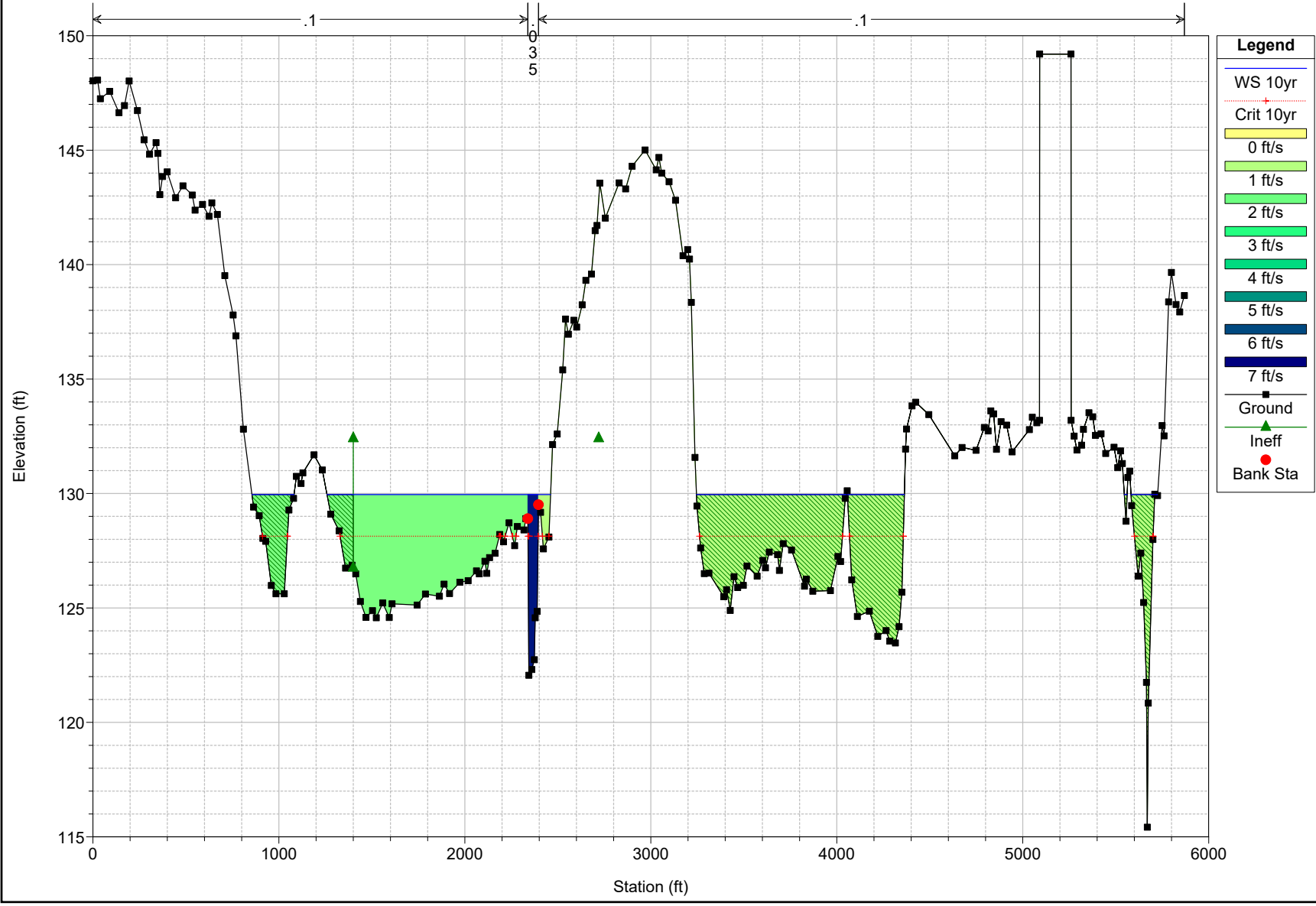
RS = 201058.7



**Legend**

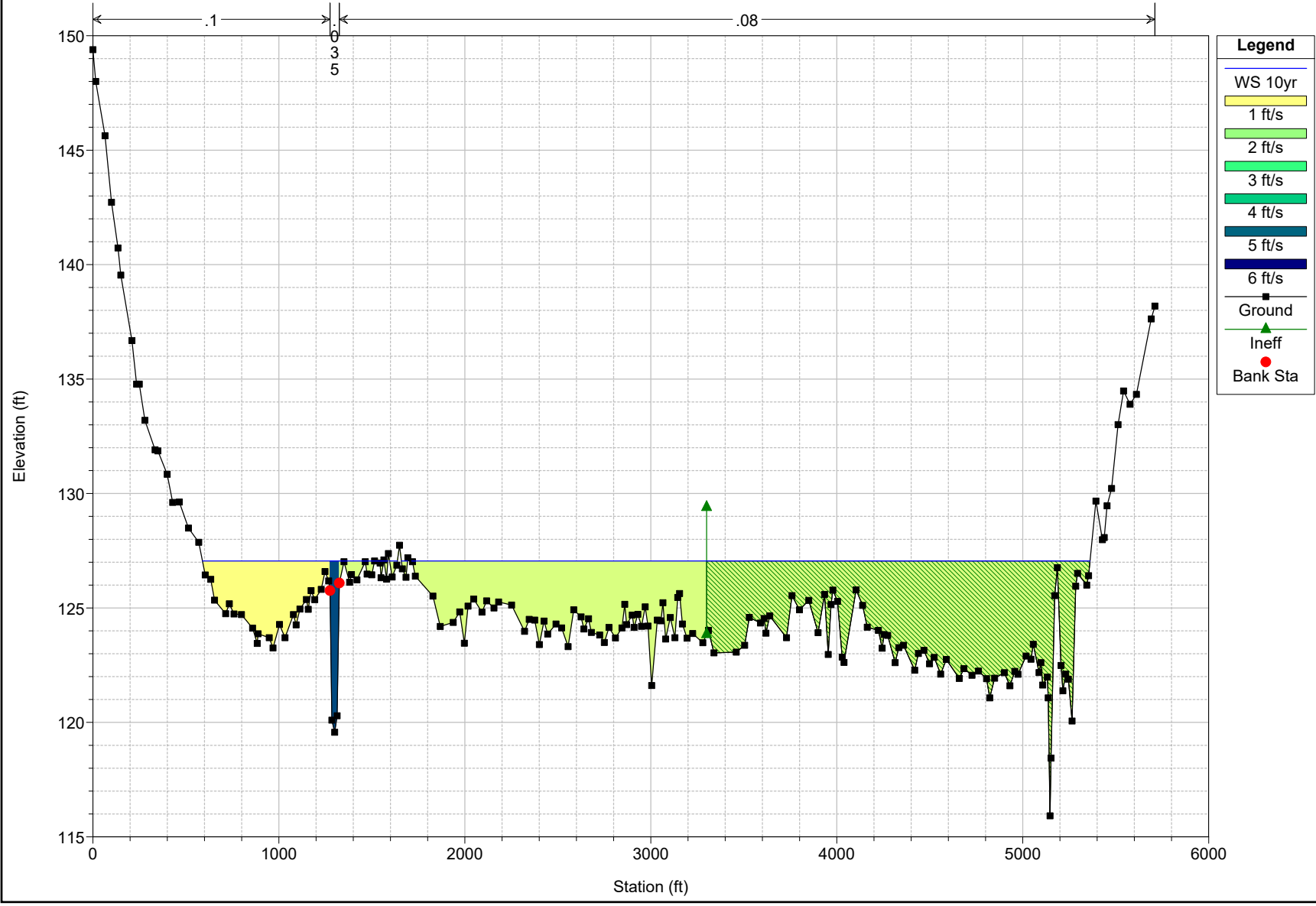
- WS 10yr
- Crit 10yr
- 0 ft/s
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- 12 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 200115.4

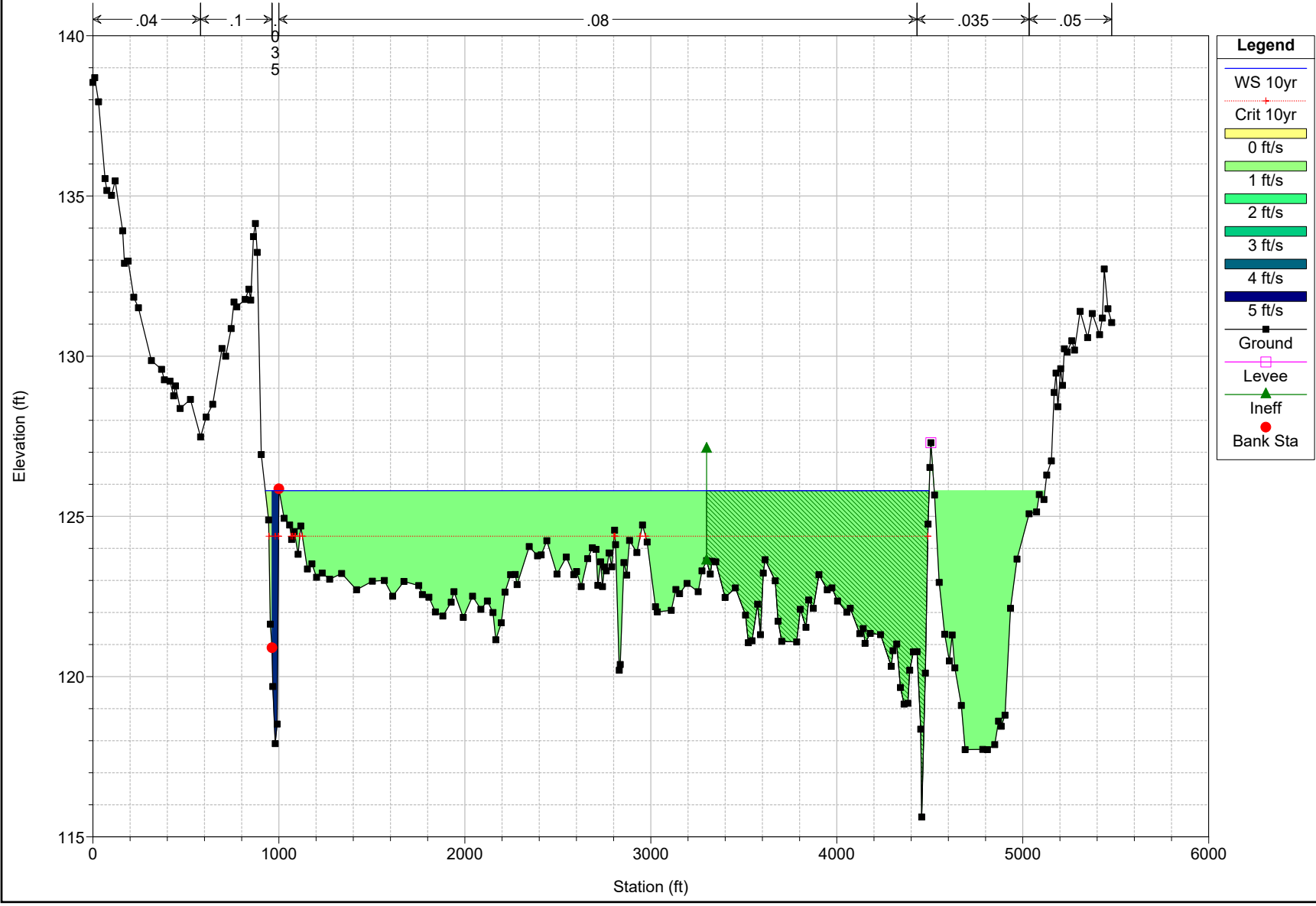




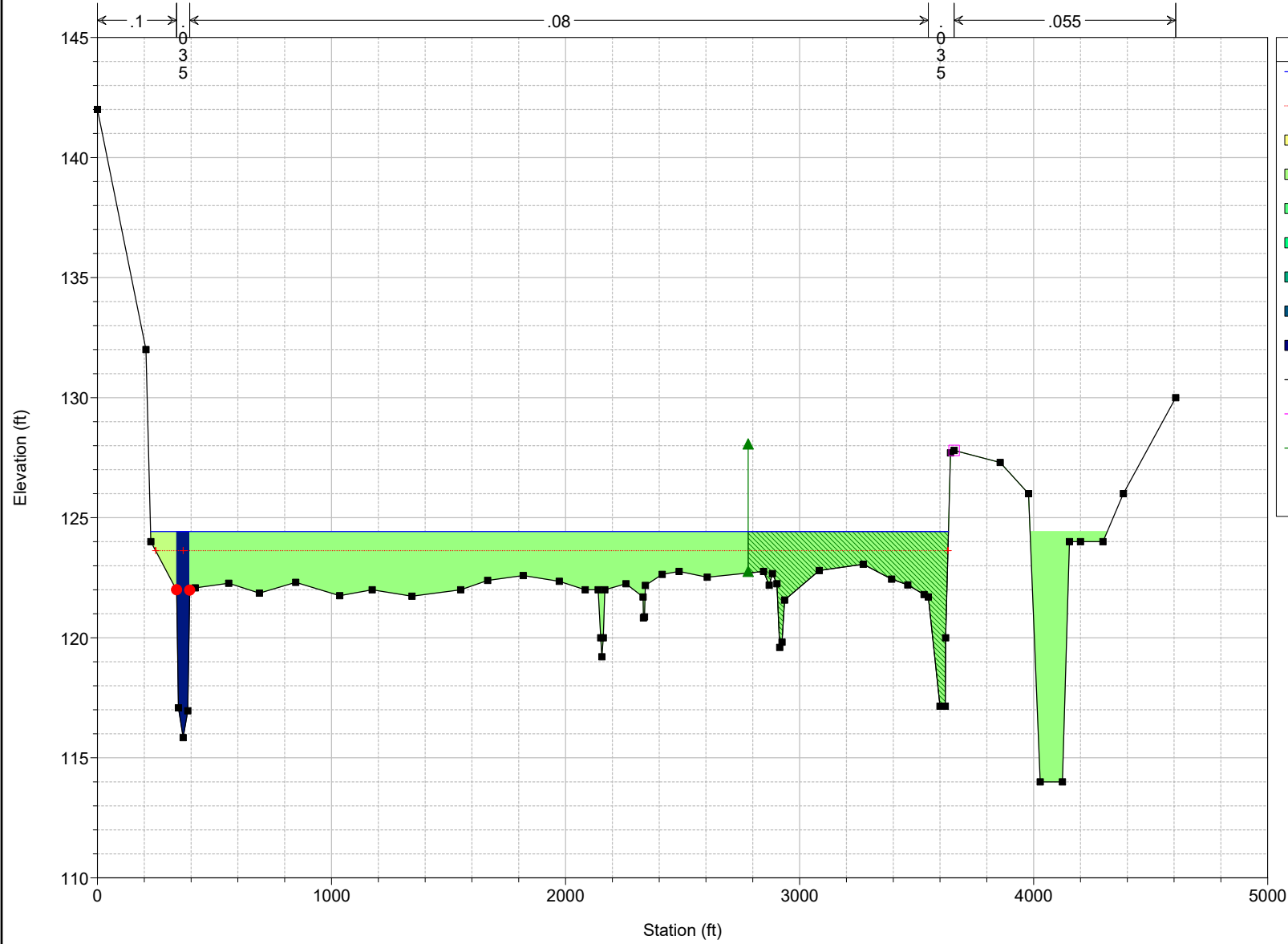
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 198588.0



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 197599.6



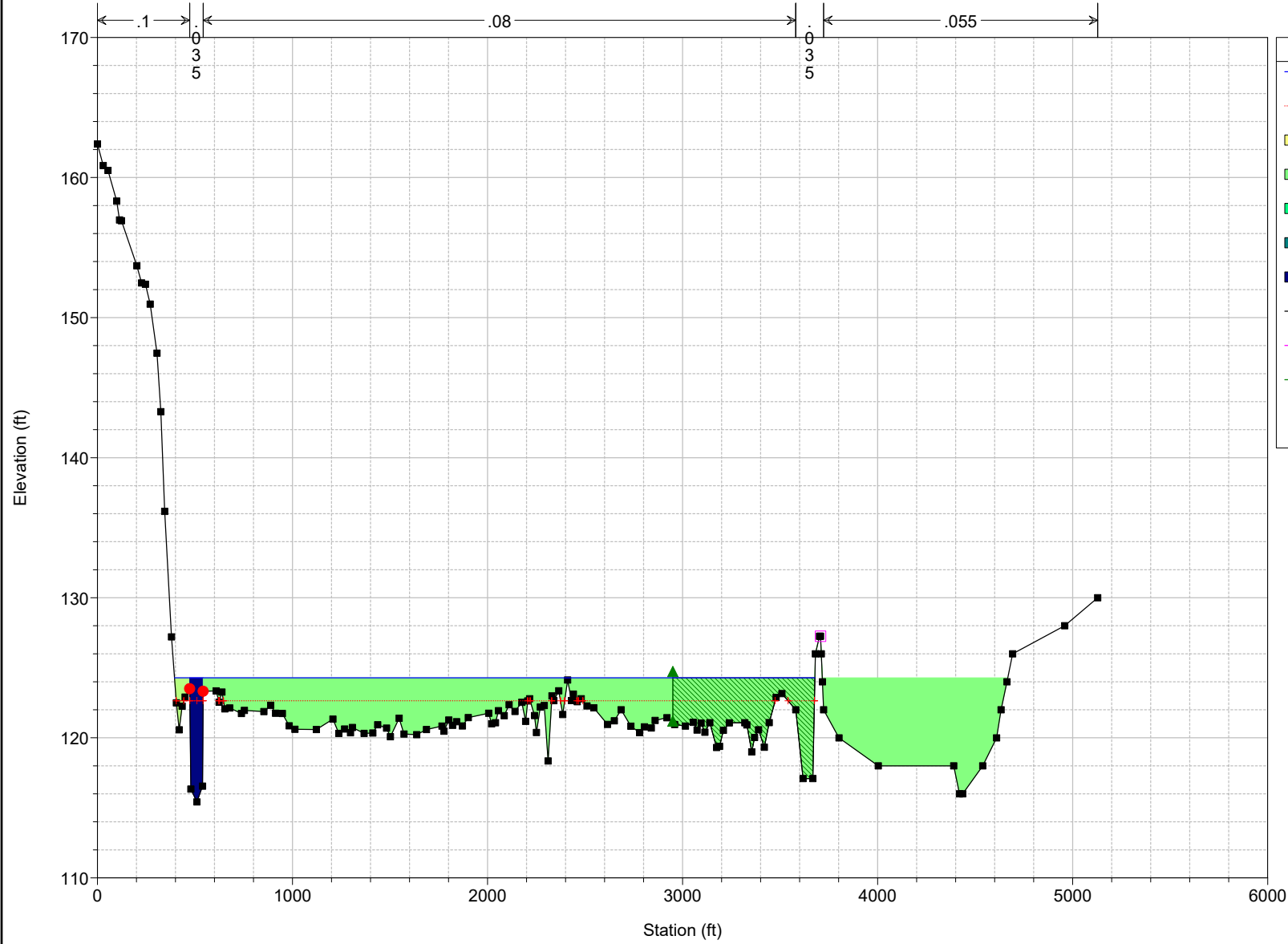
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 196568.8



**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- Ground
- Levee
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 196356.8

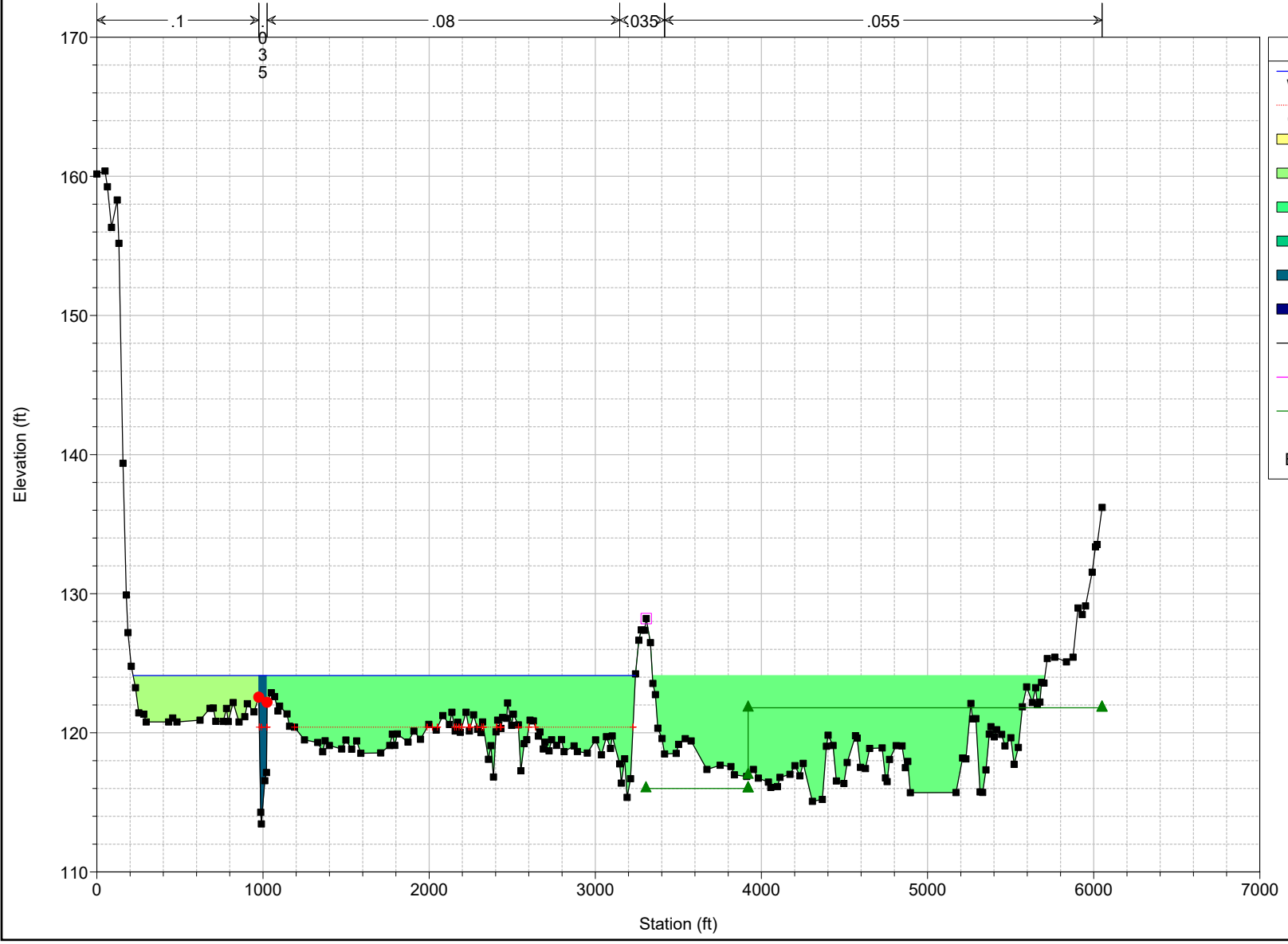


**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- Ground
- Levee
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

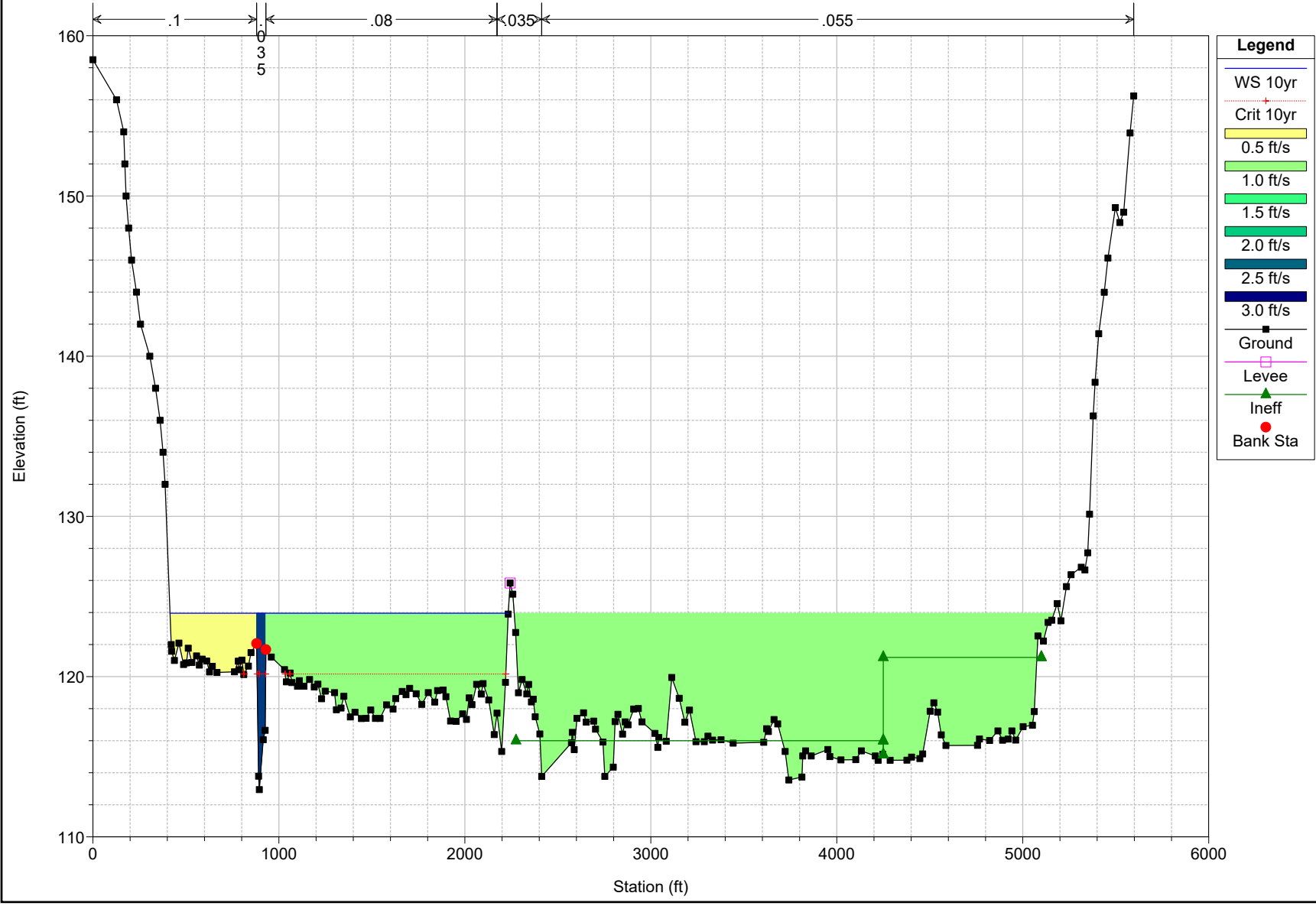
RS = 195583.1



**Legend**

- WS 10yr
- Crit 10yr
- 0.0 ft/s
- 0.5 ft/s
- 1.0 ft/s
- 1.5 ft/s
- 2.0 ft/s
- 2.5 ft/s
- Ground
- Levee
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 194817.8



- Legend**
- WS 10yr
  - Crit 10yr
  - 0.5 ft/s
  - 1.0 ft/s
  - 1.5 ft/s
  - 2.0 ft/s
  - 2.5 ft/s
  - 3.0 ft/s
  - Ground
  - Levee
  - Ineff
  - Bank Sta

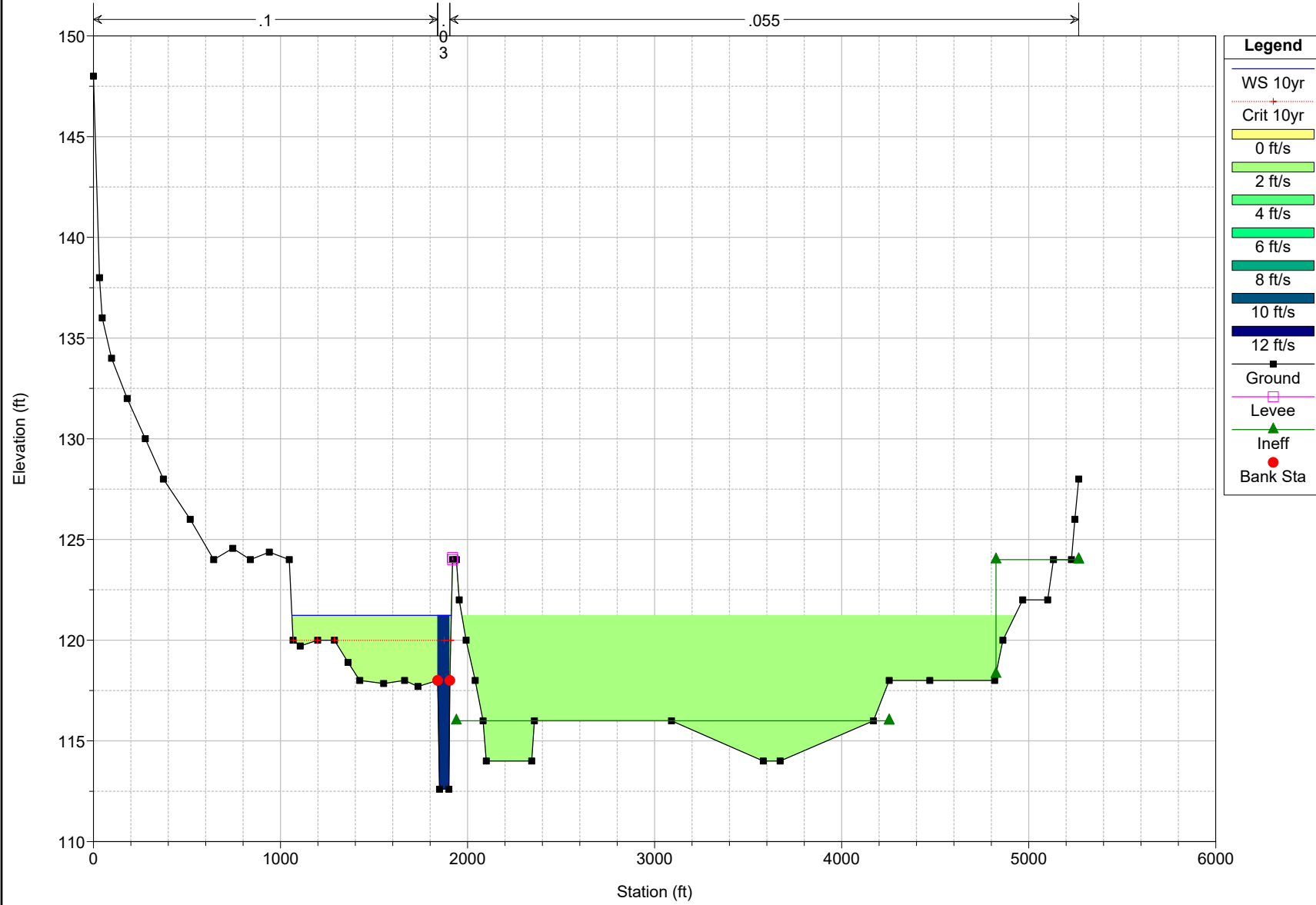
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193854.4



**Legend**

- WS 10yr
- Crit 10yr
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Levee
- Ineff
- Bank Sta

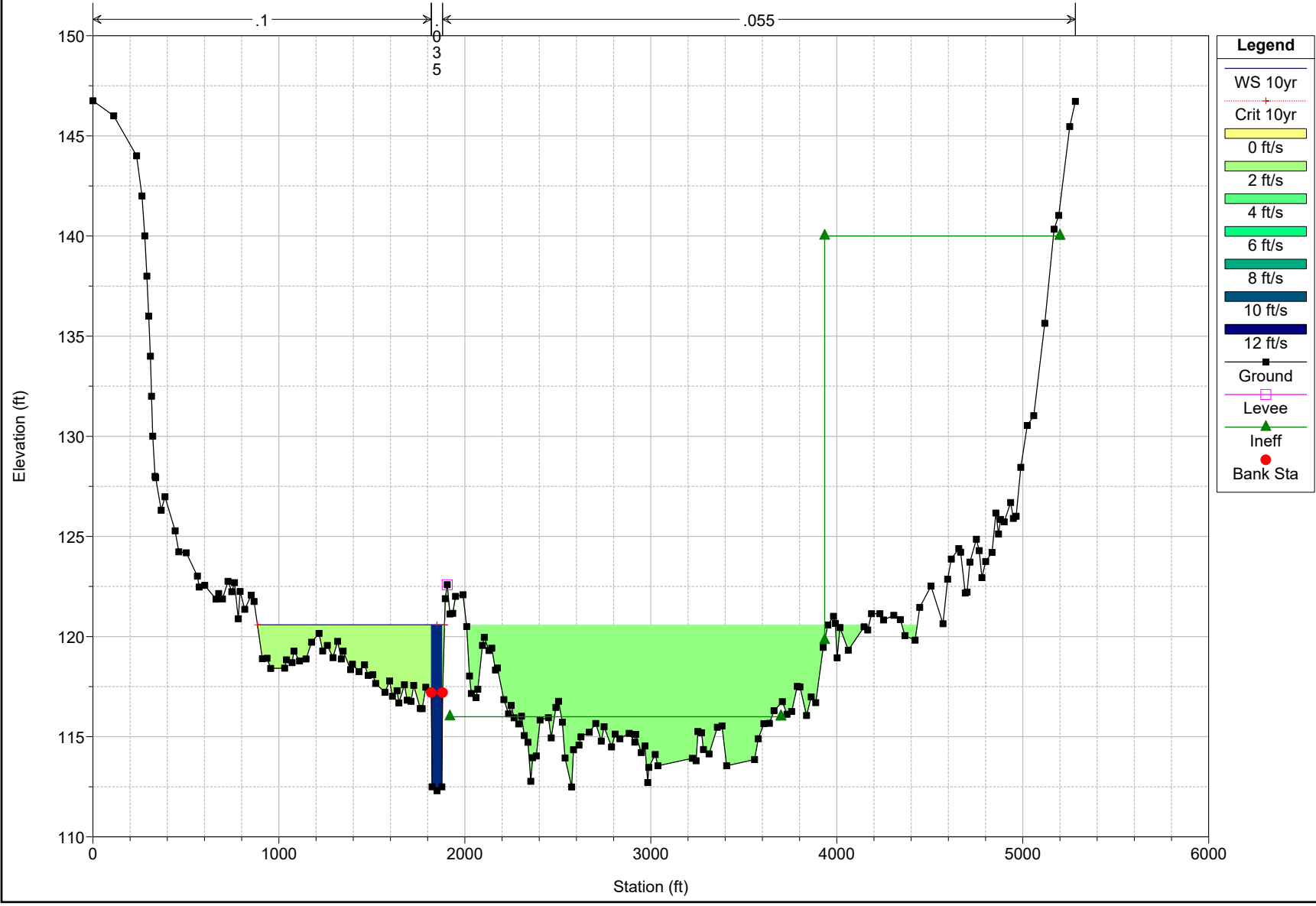
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193357.9



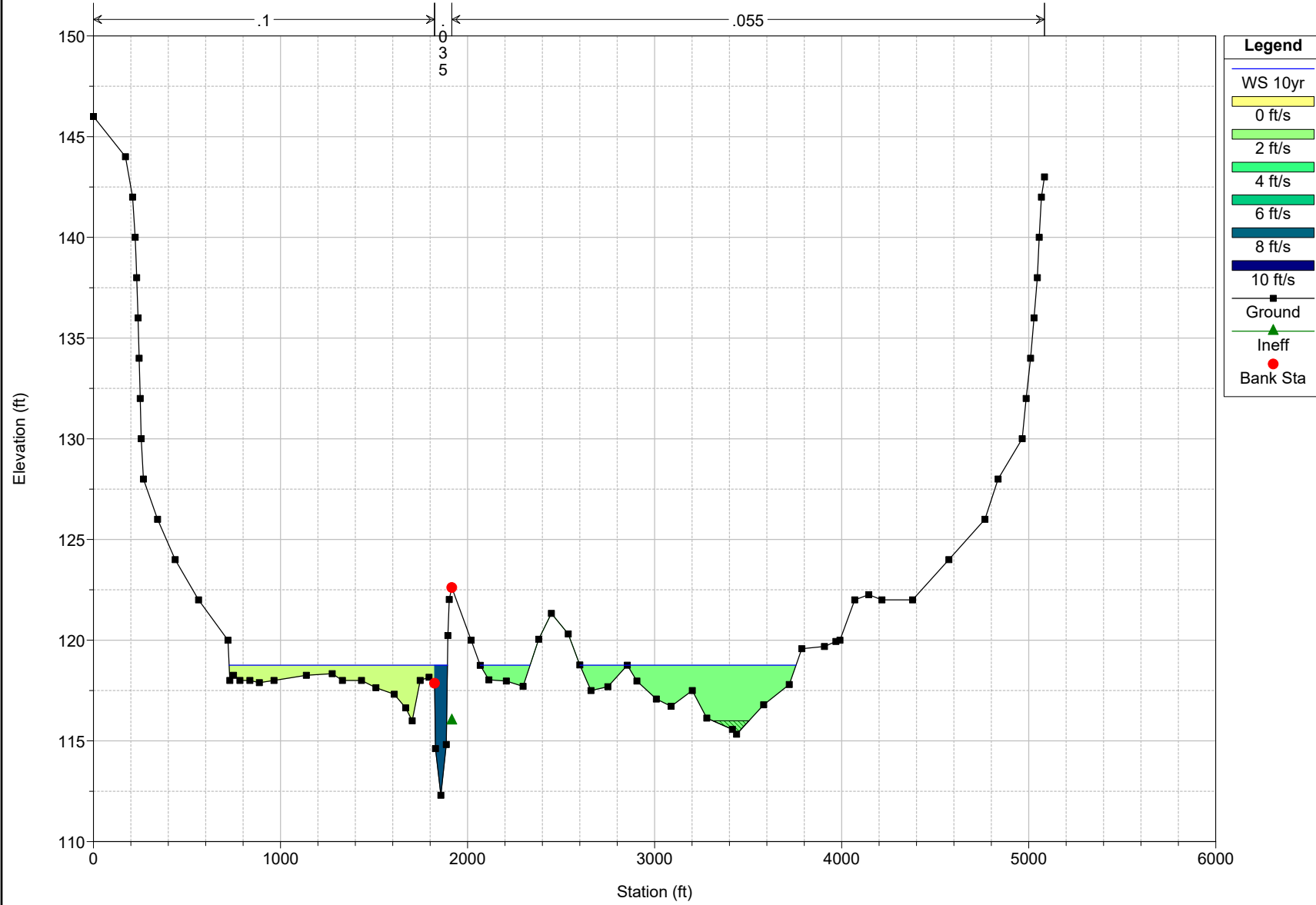
- Legend**
- WS 10yr
  - Crit 10yr
  - 0 ft/s
  - 2 ft/s
  - 4 ft/s
  - 6 ft/s
  - 8 ft/s
  - 10 ft/s
  - 12 ft/s
  - Ground
  - Levee
  - Ineff
  - Bank Sta



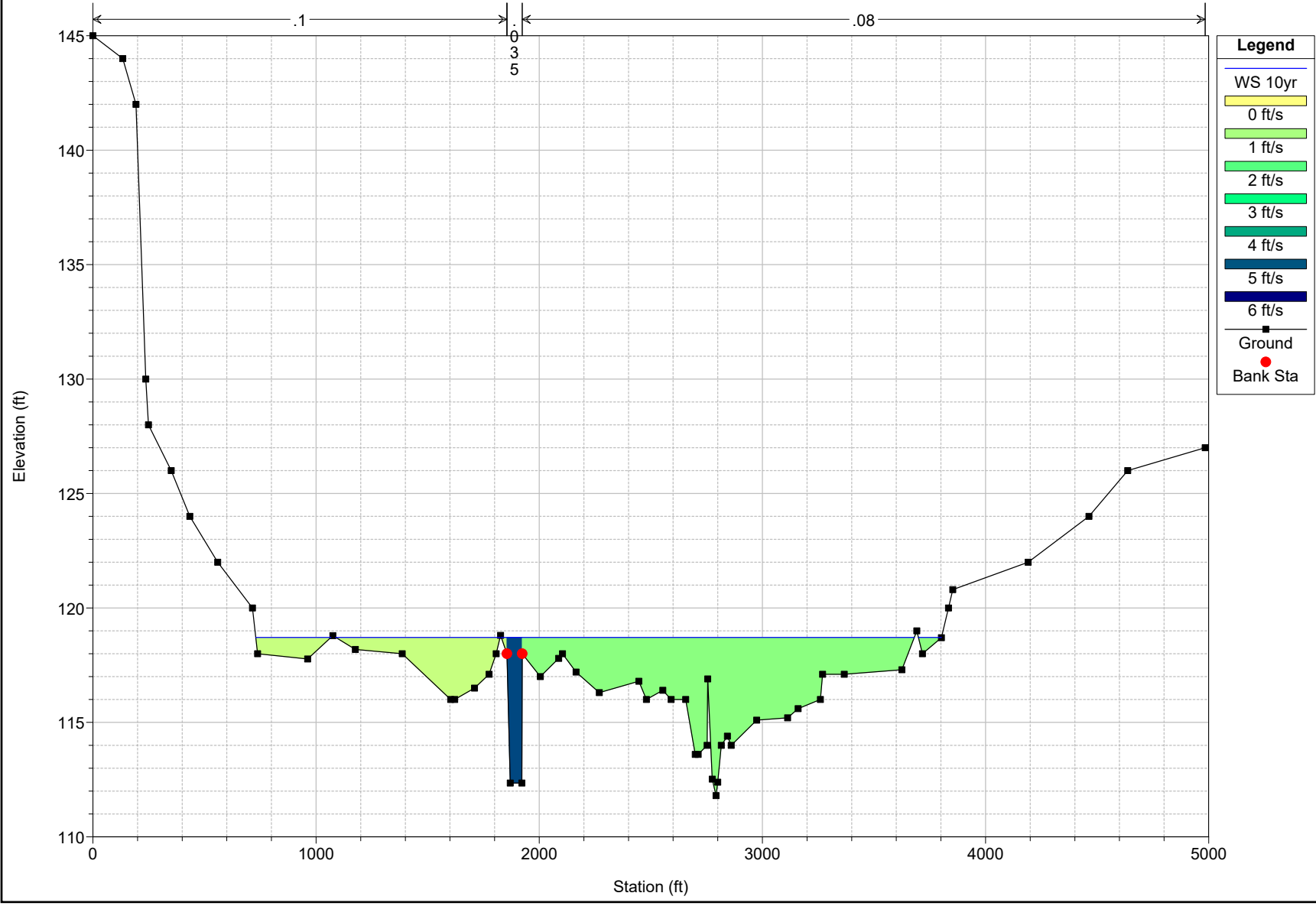
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193176.6



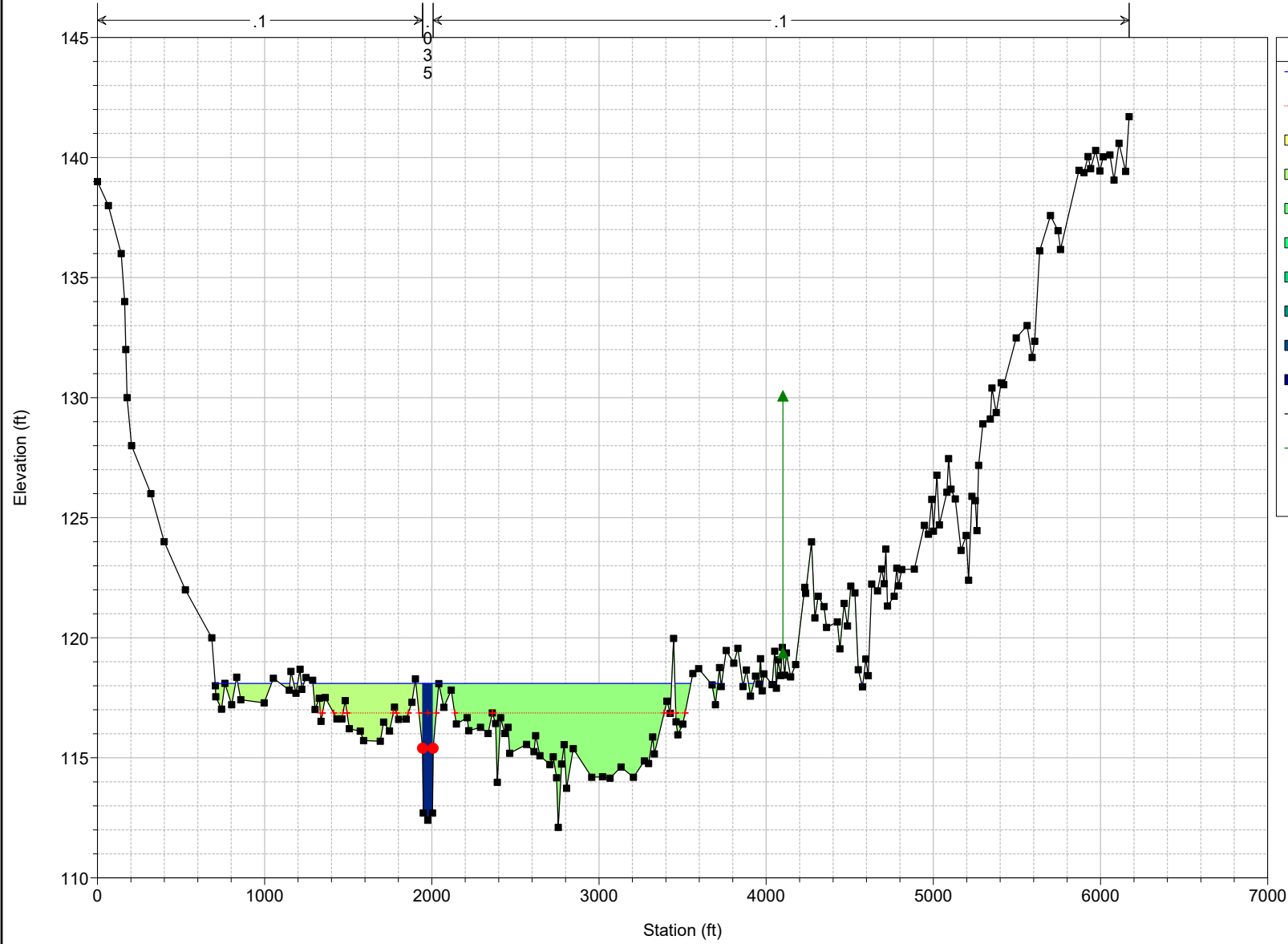
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 192867



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 192774.7



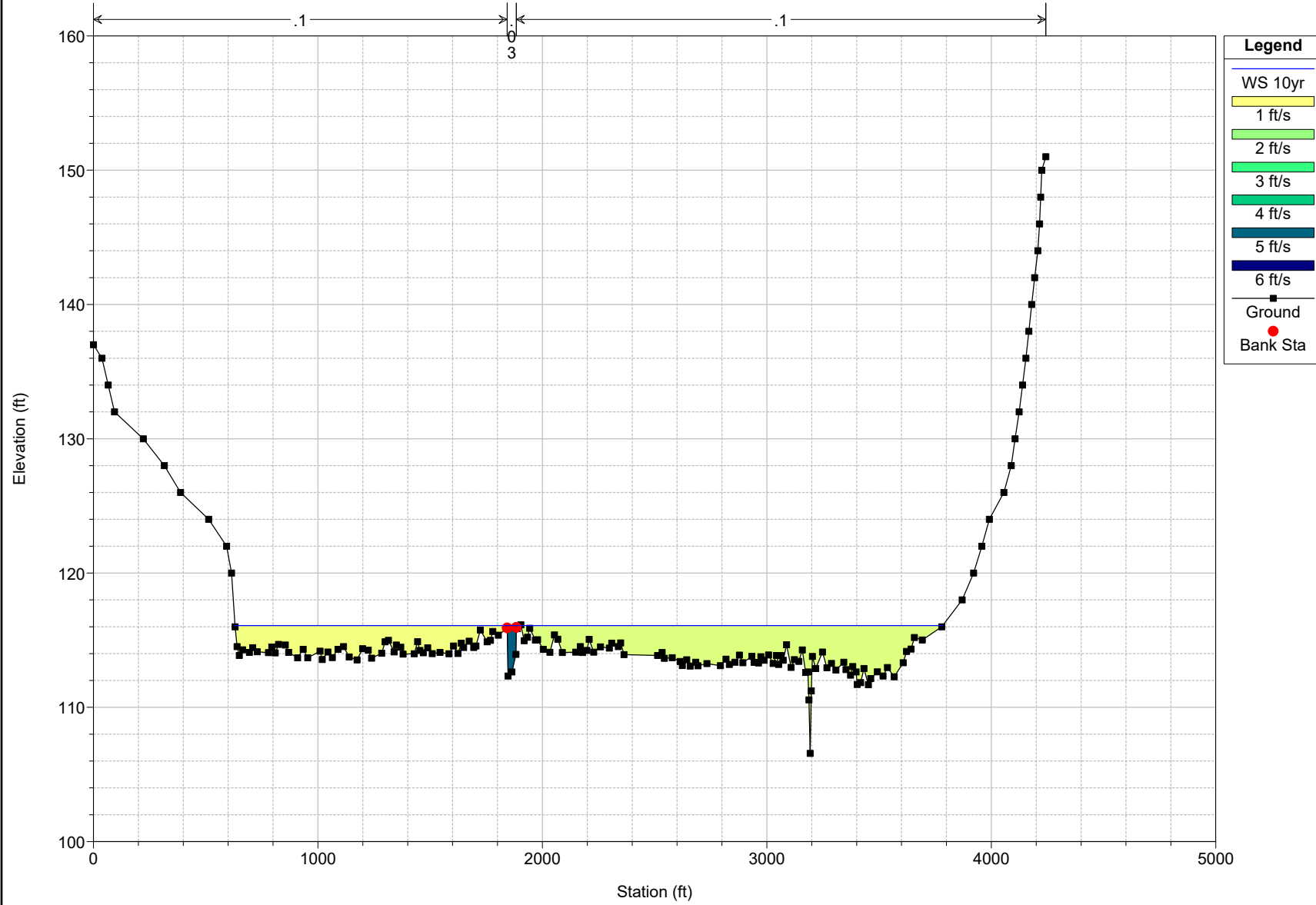
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 192514.9



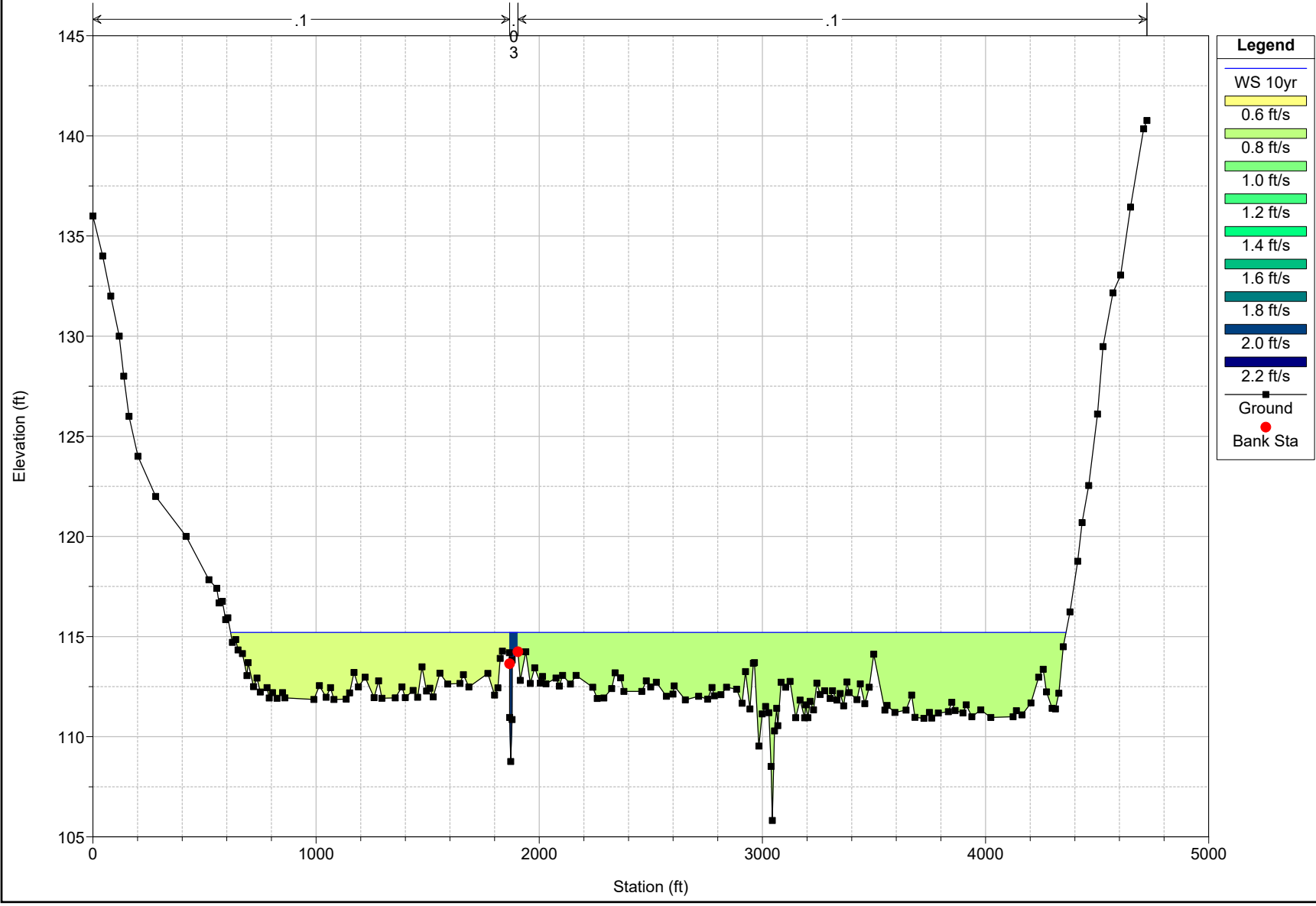
**Legend**

- WS 10yr
- Crit 10yr
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 191681.5



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 190879.0

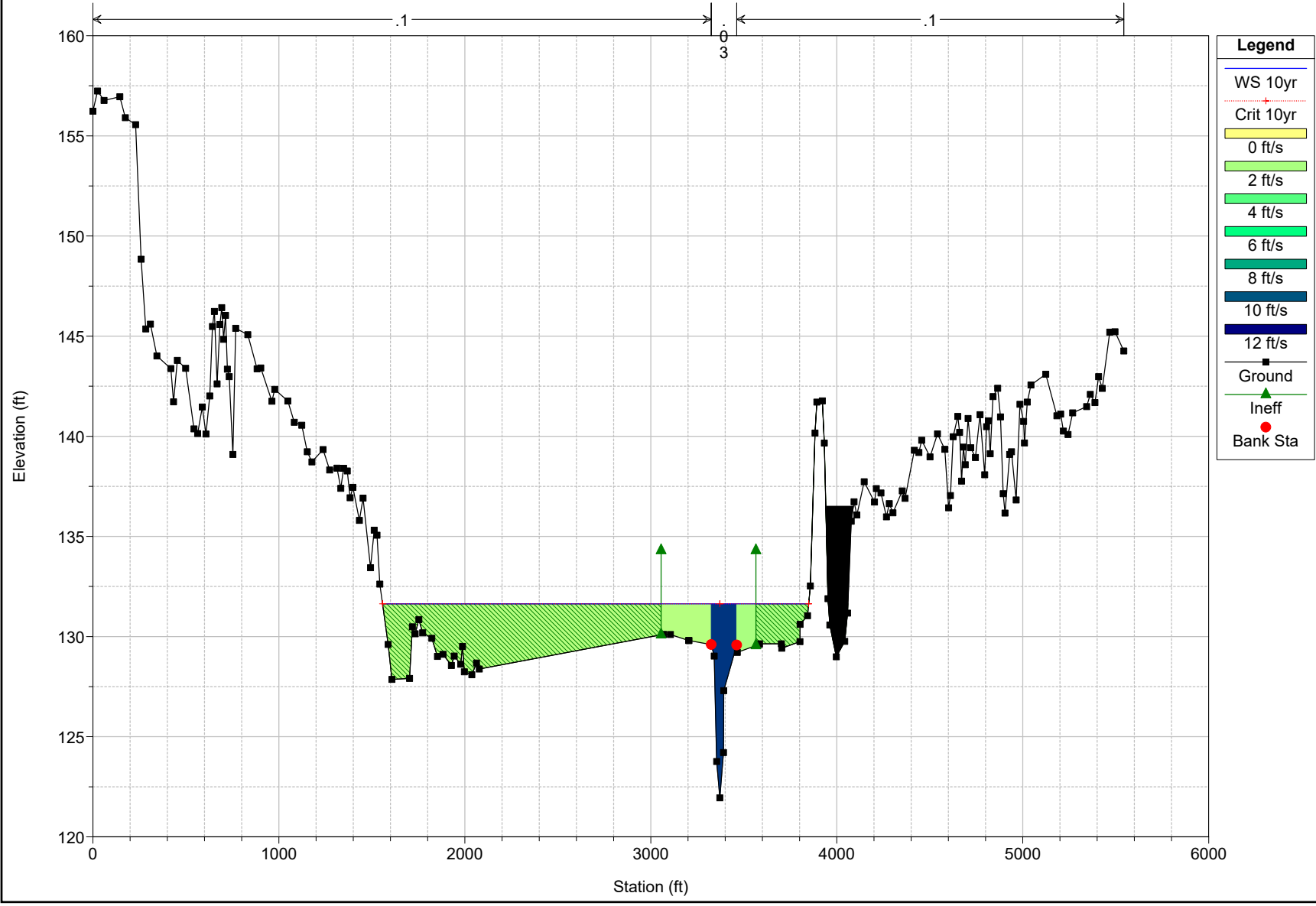


## **Appendix B**

### **Proposed 10-yr Storm Cross Sections with**

### **Velocity**

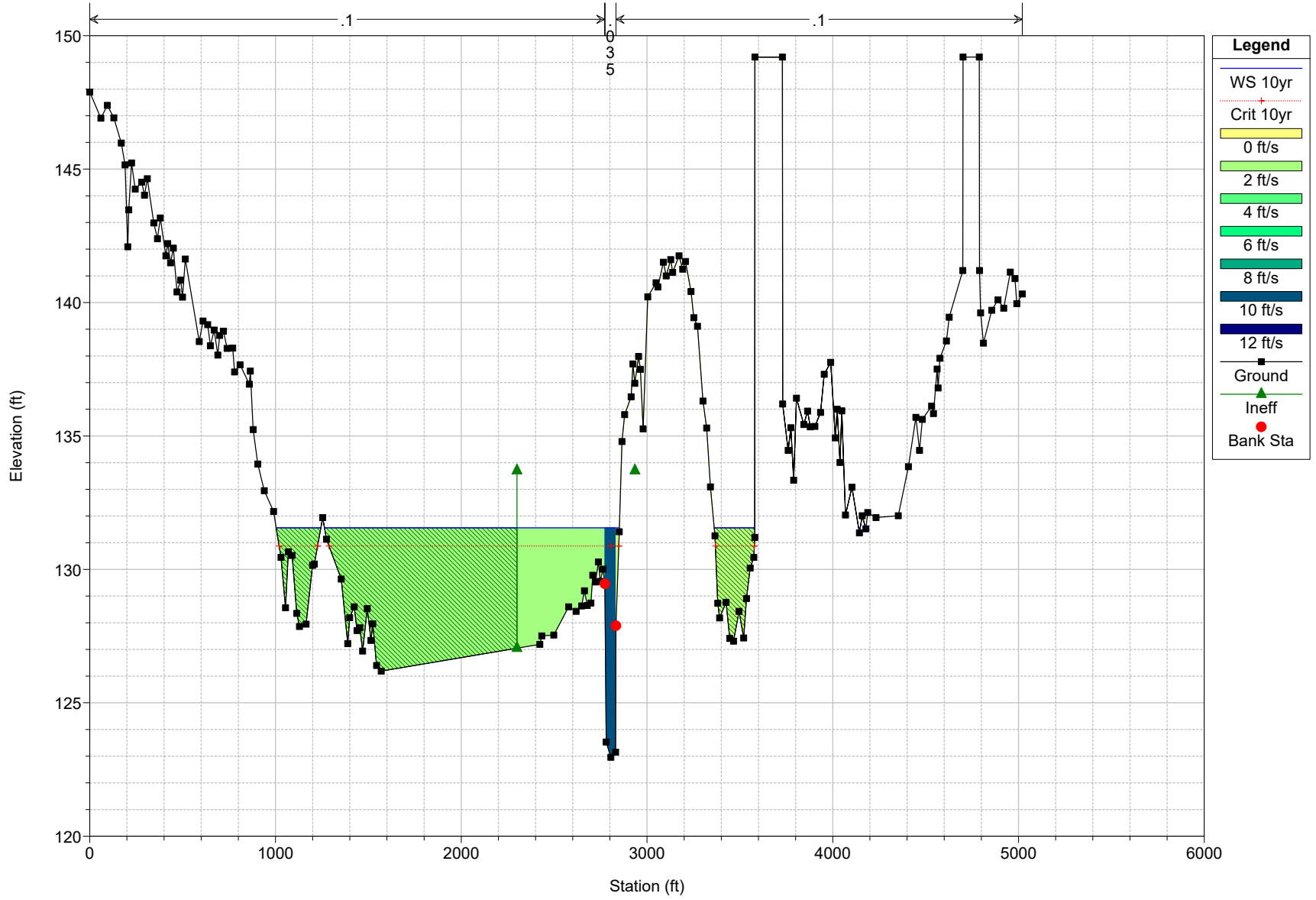
Patuxent River Plan: Plan 04 6/5/2019  
RS = 201119



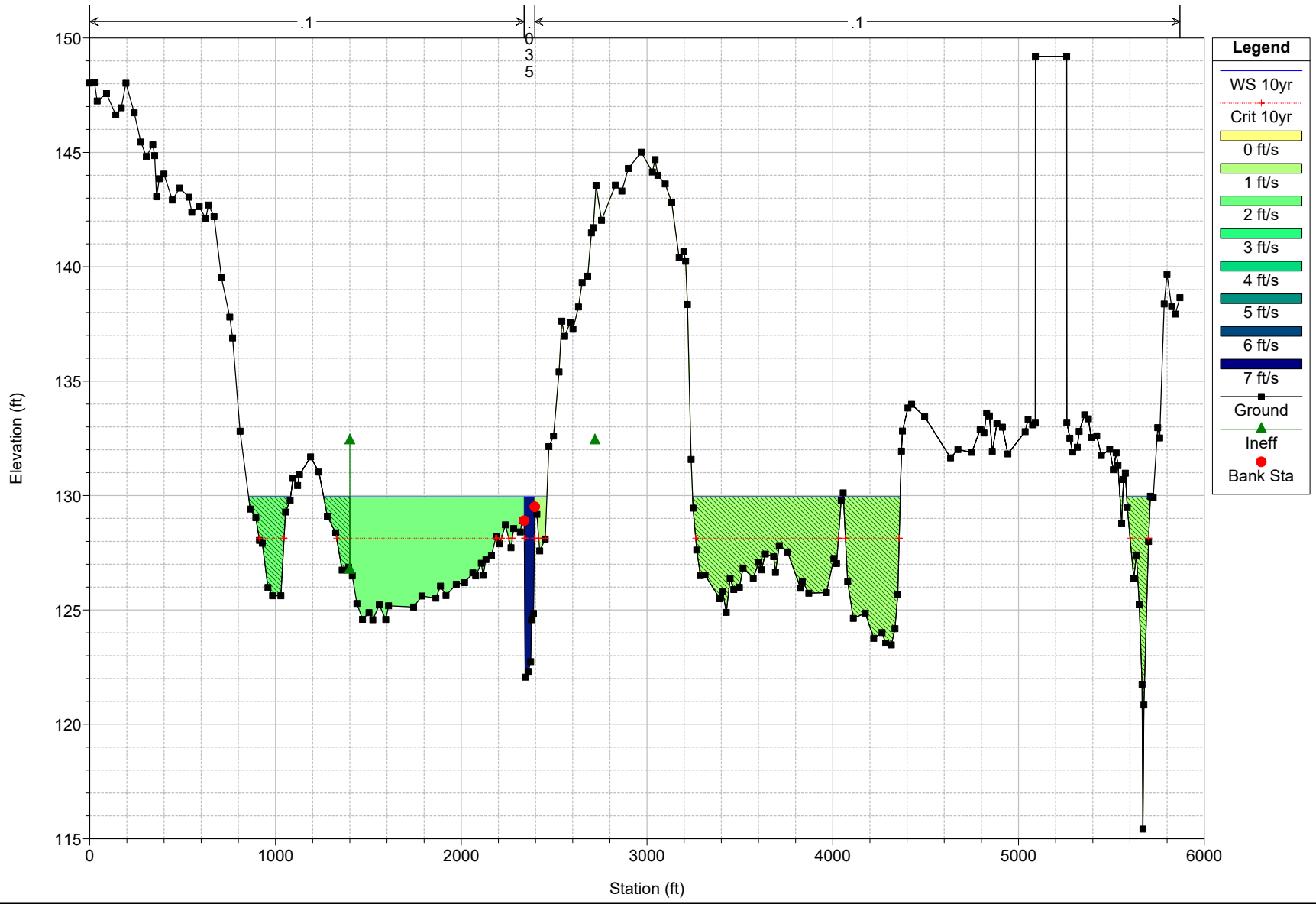


Patuxent River Plan: Plan 04 6/5/2019

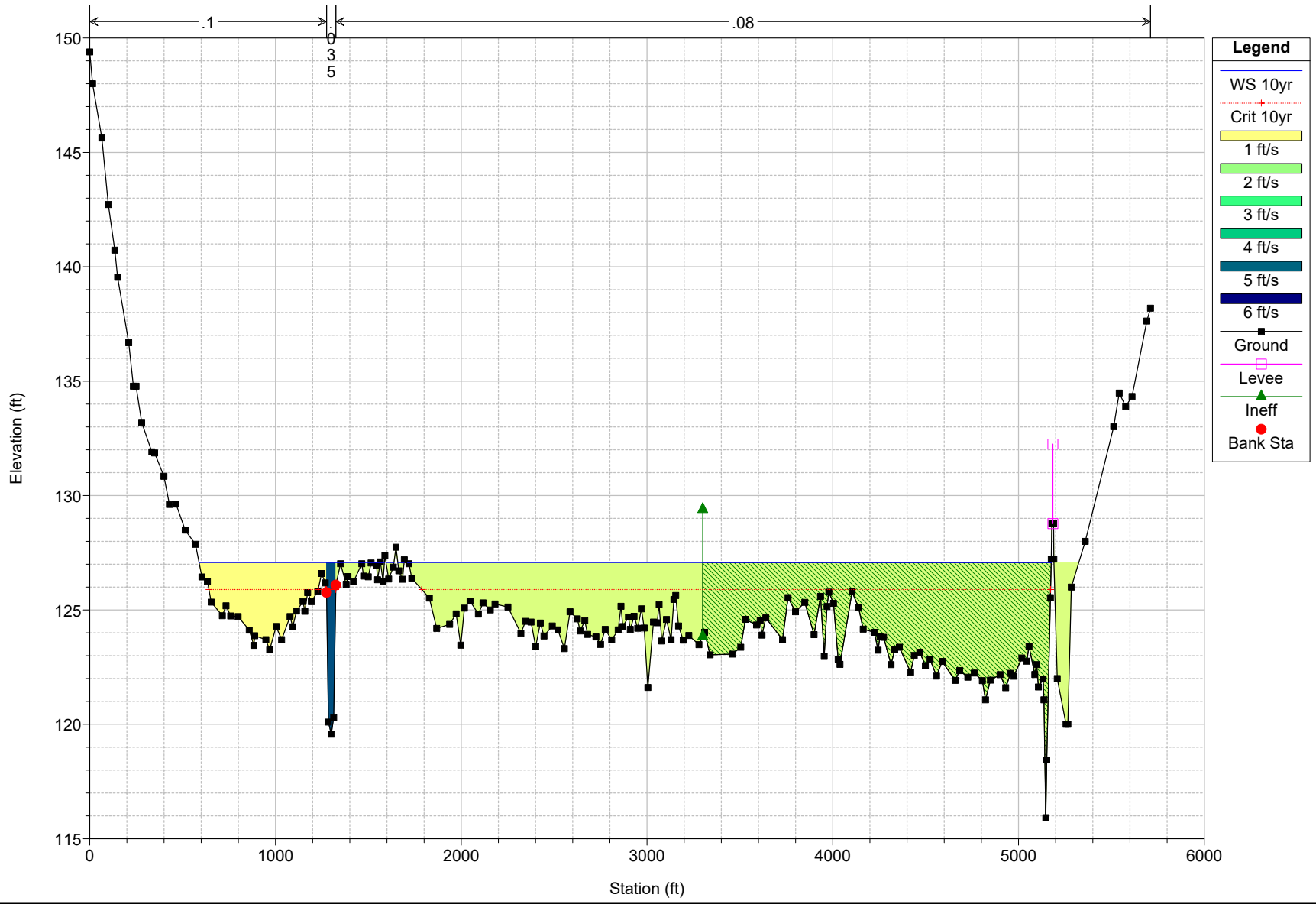
RS = 201058.7



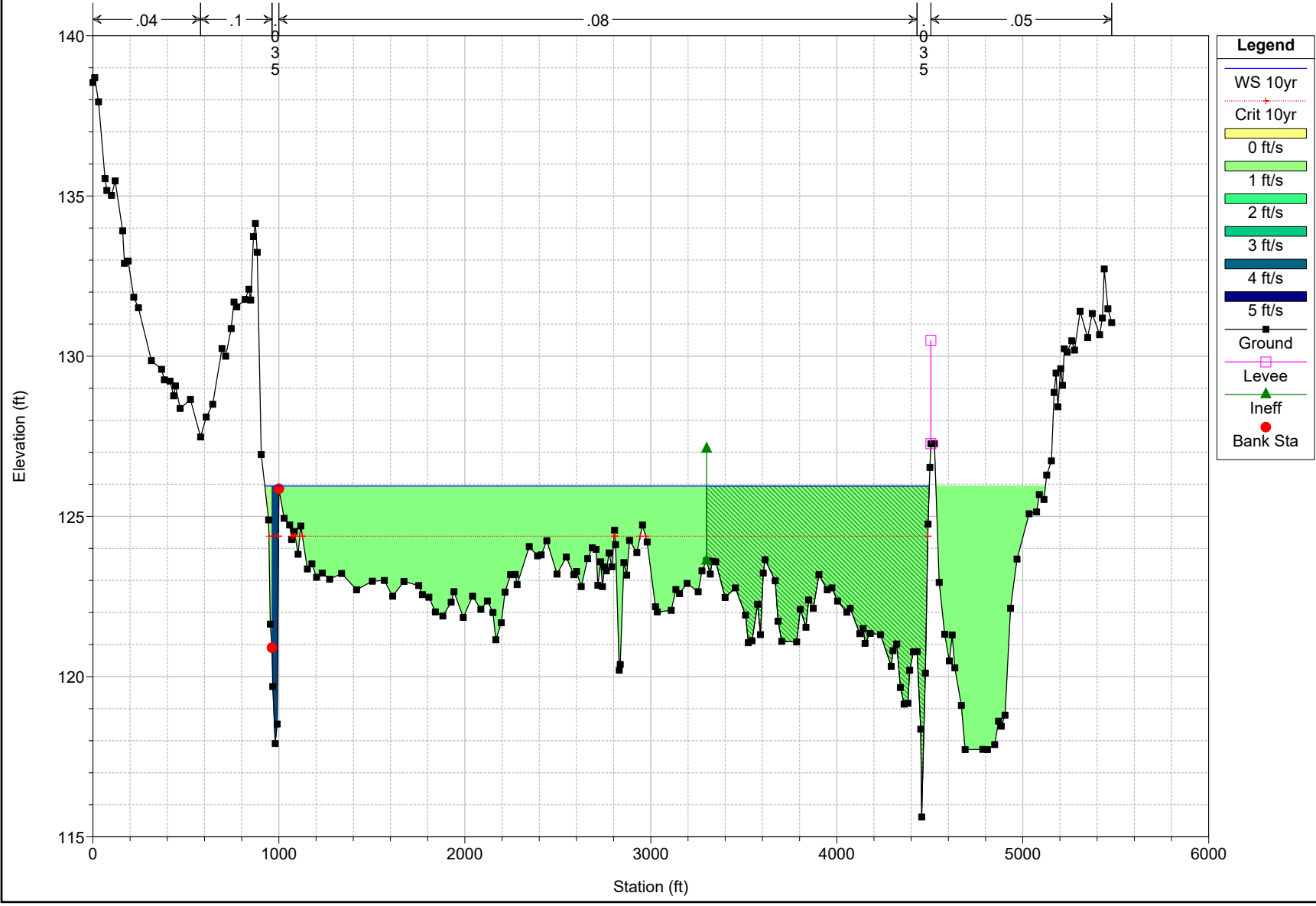
Patuxent River Plan: Plan 04 6/5/2019  
RS = 200115.4



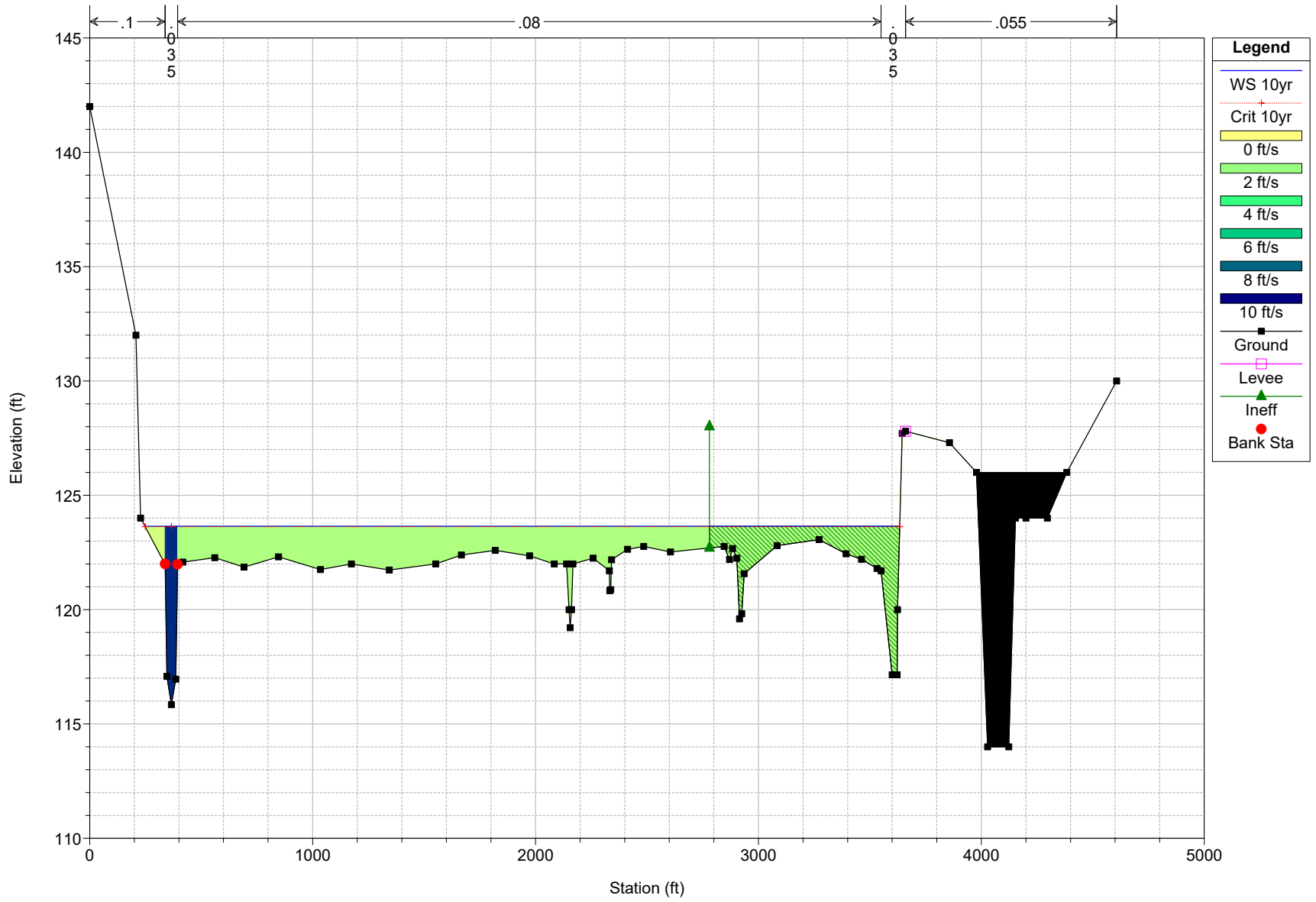
Patuxent River Plan: Plan 04 6/5/2019  
RS = 198588.0



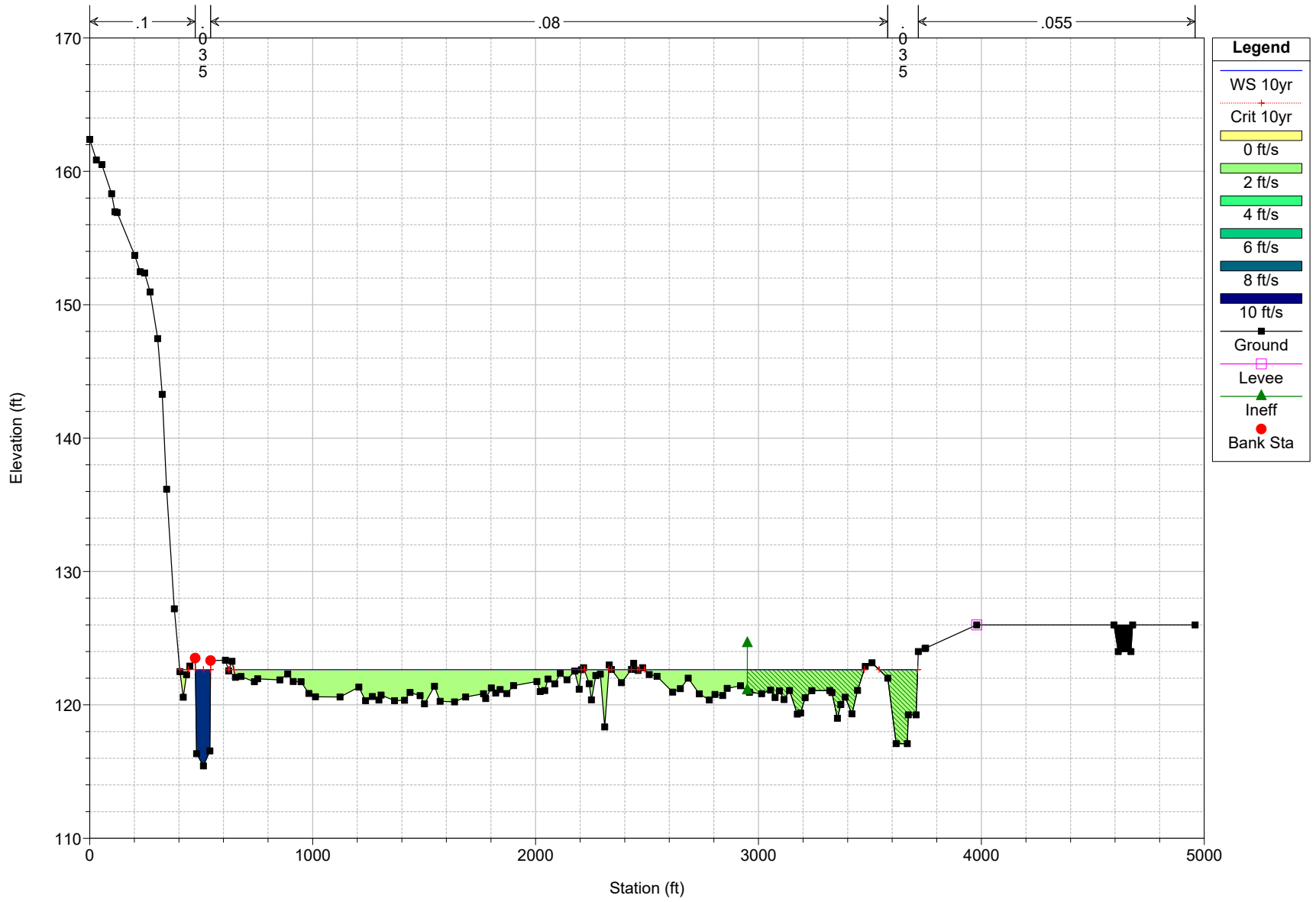
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 197599.6



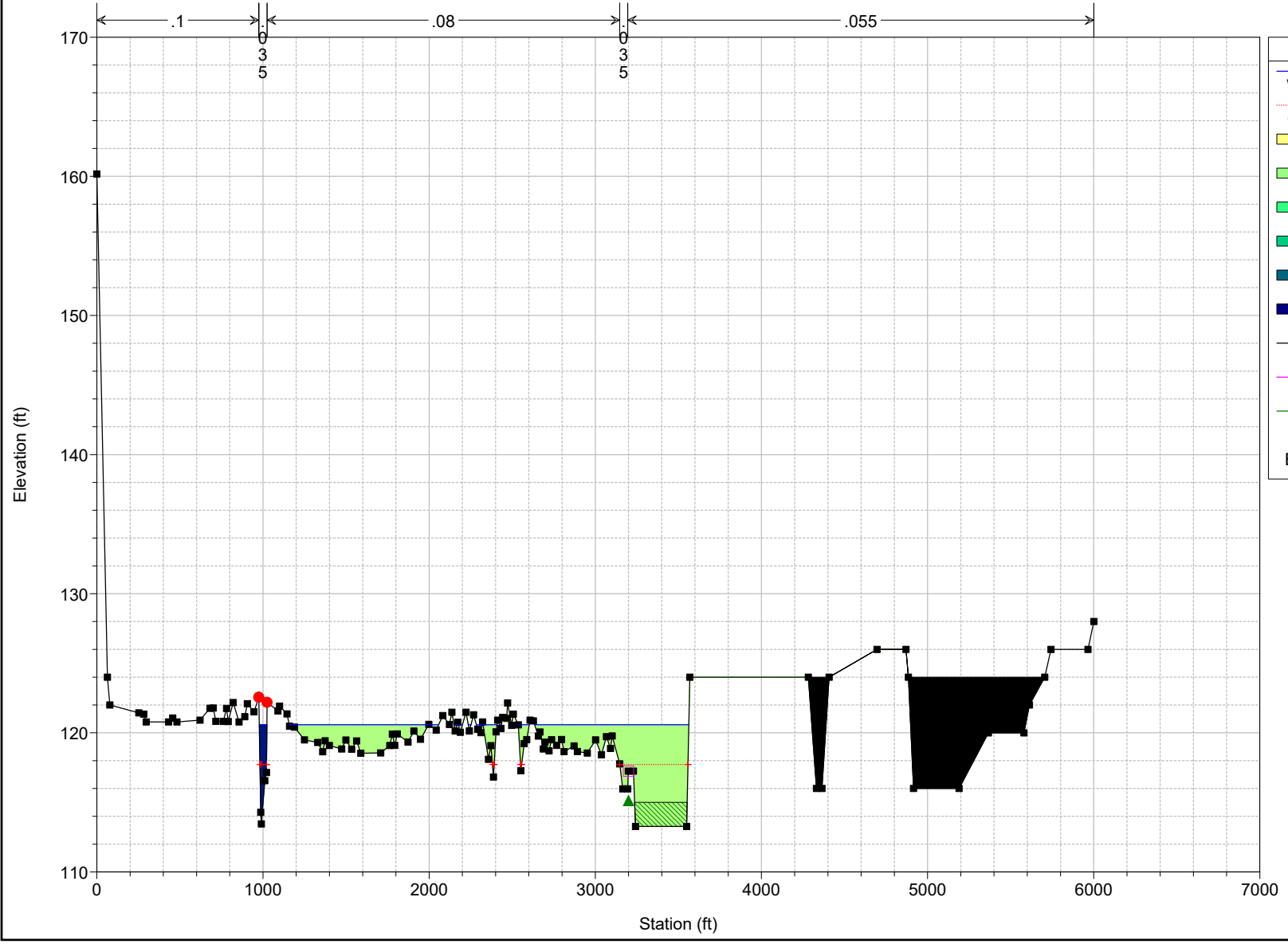
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 196568.8



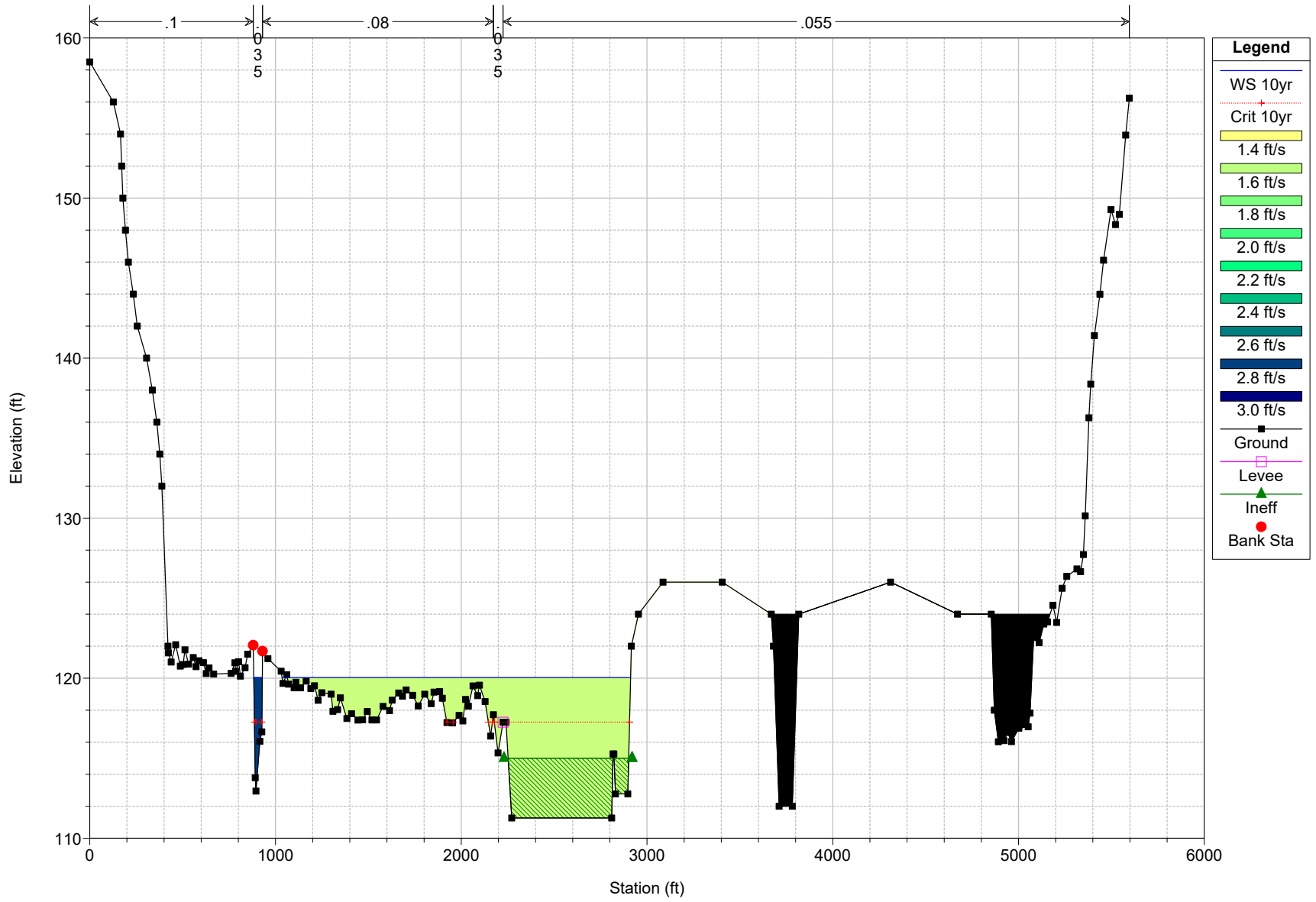
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 196356.8



Patuxent River Plan: Plan 04 6/5/2019  
RS = 195583.1

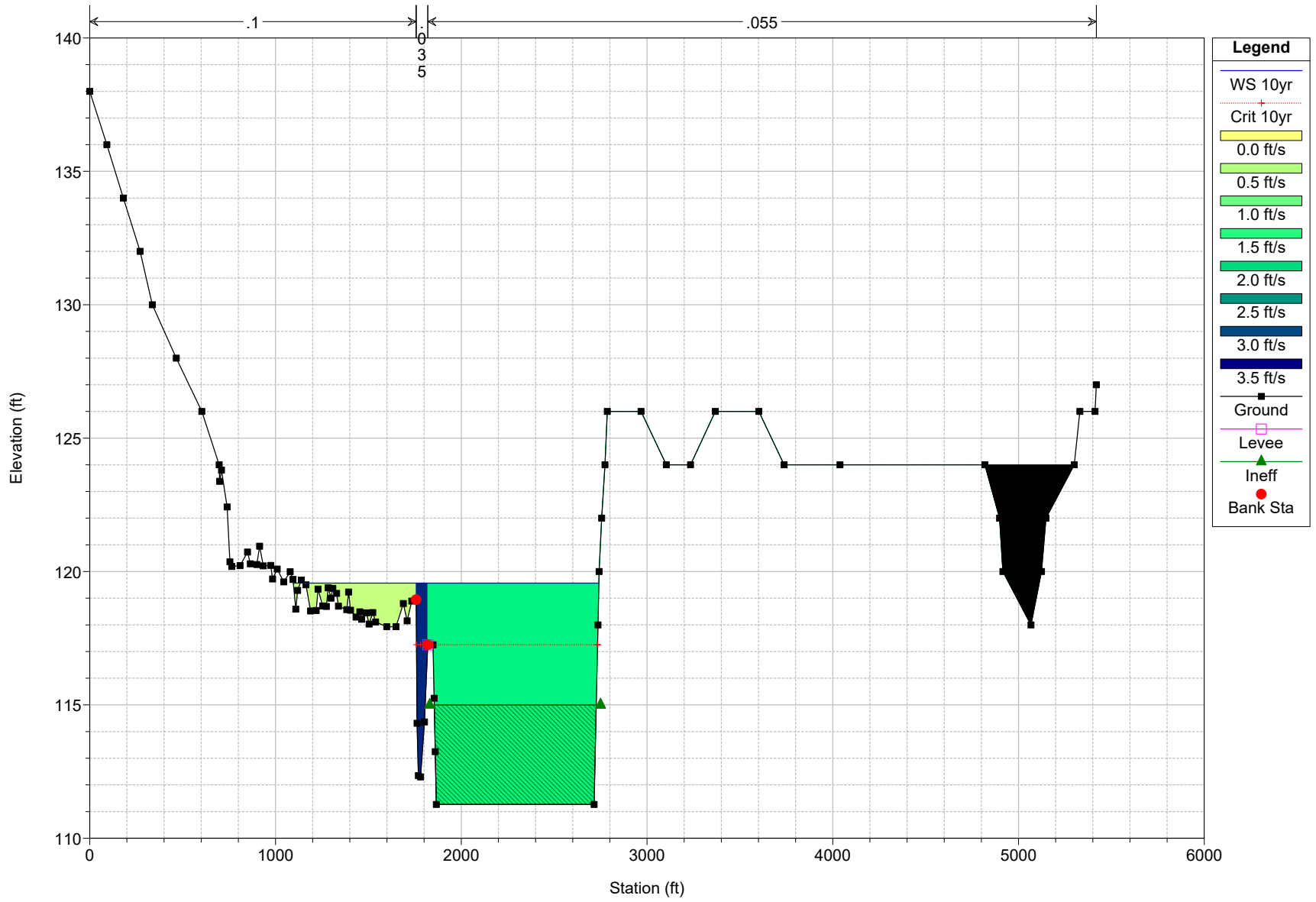


Patuxent River Plan: Plan 04 6/5/2019  
 RS = 194817.8

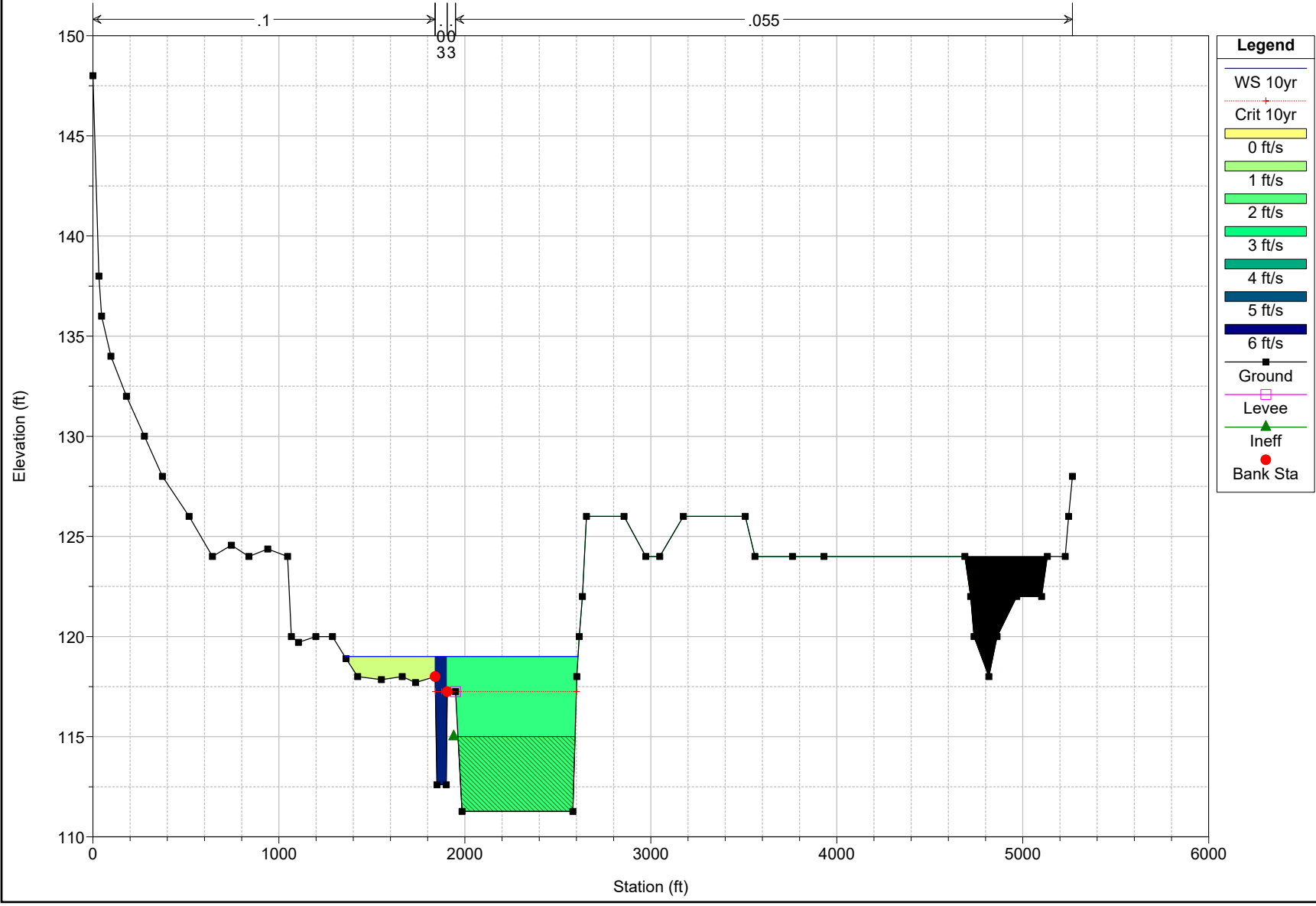




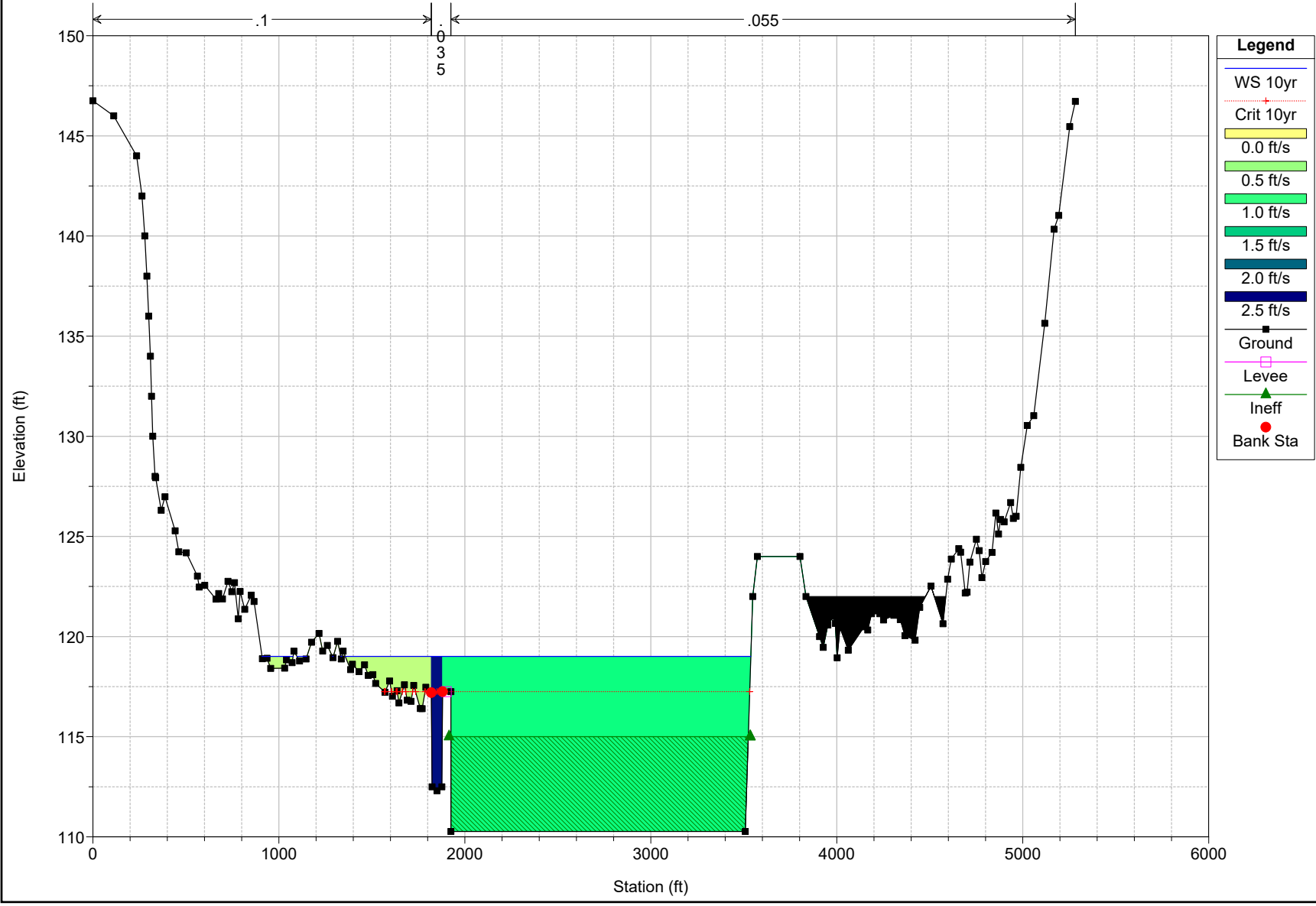
Patuxent River Plan: Plan 04 6/5/2019  
RS = 193854.4



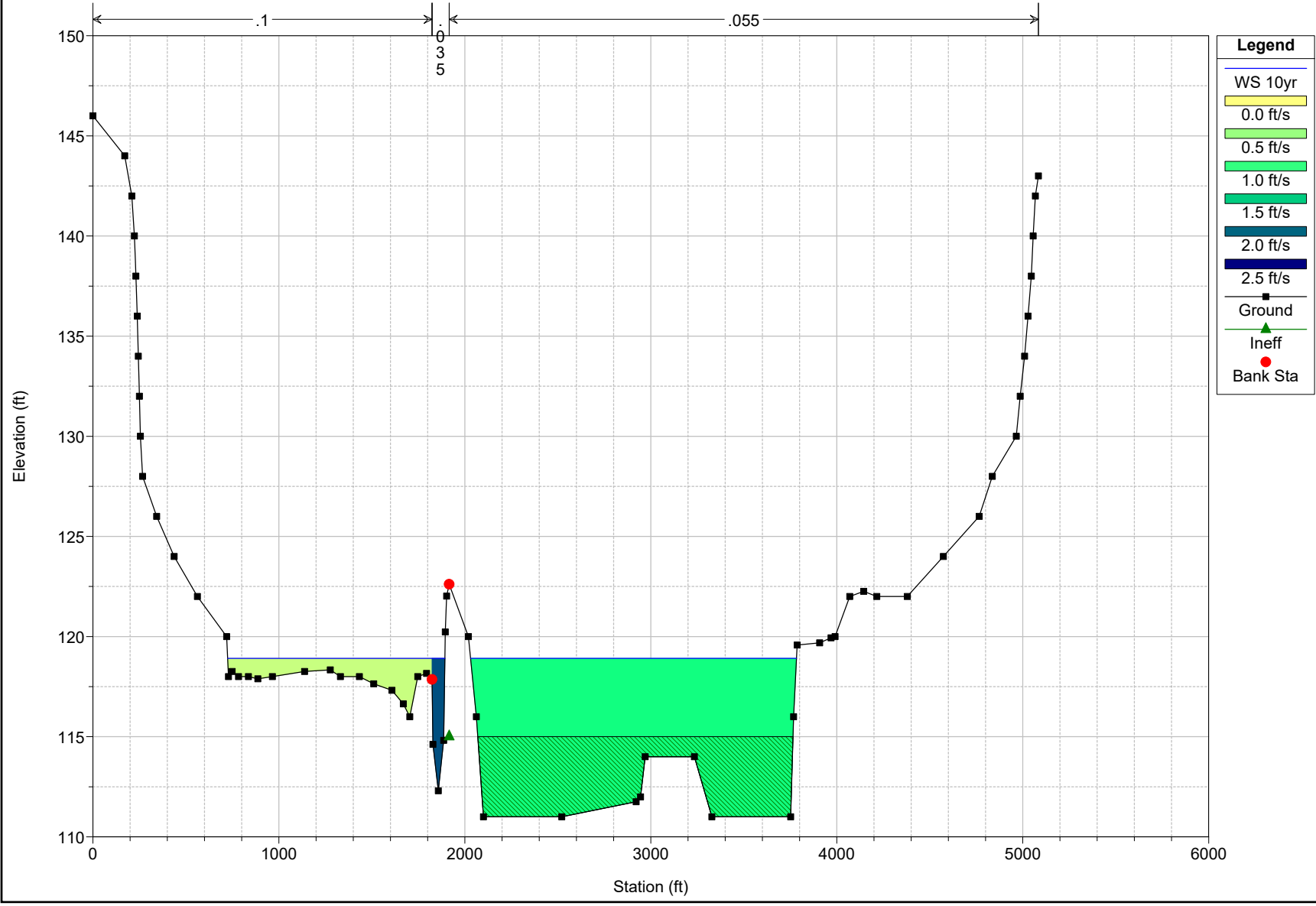
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193357.9



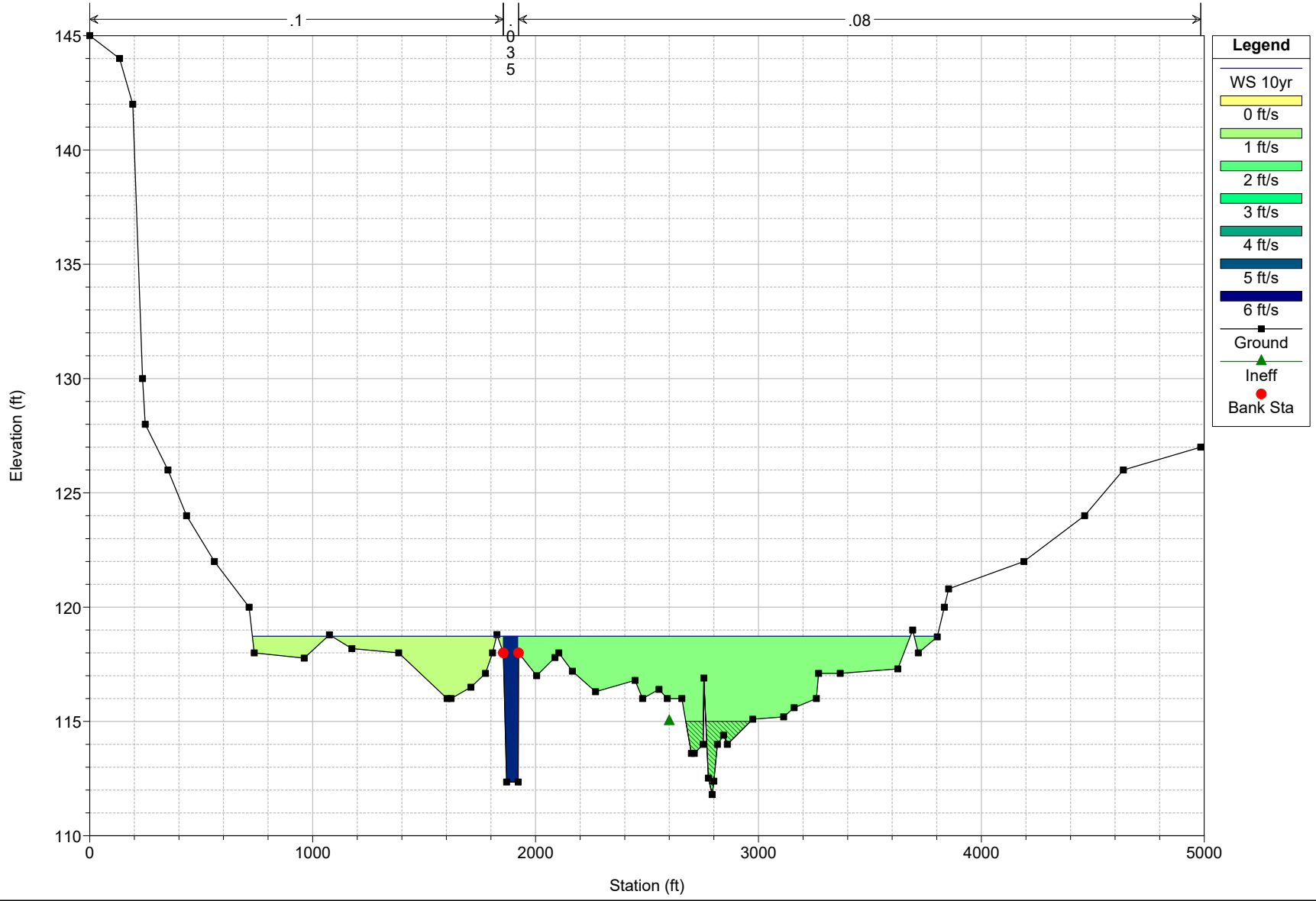
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193176.6



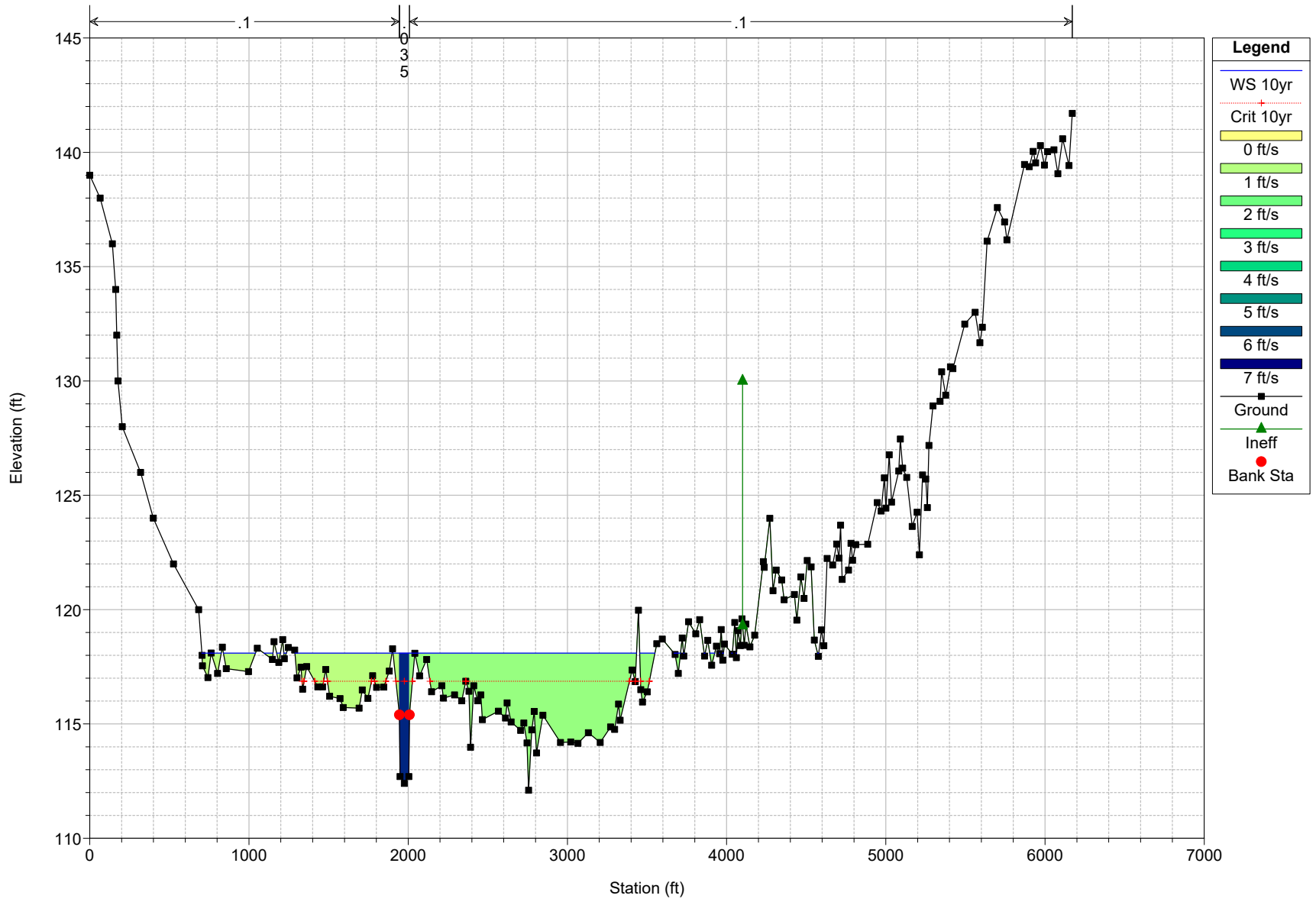
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 192867



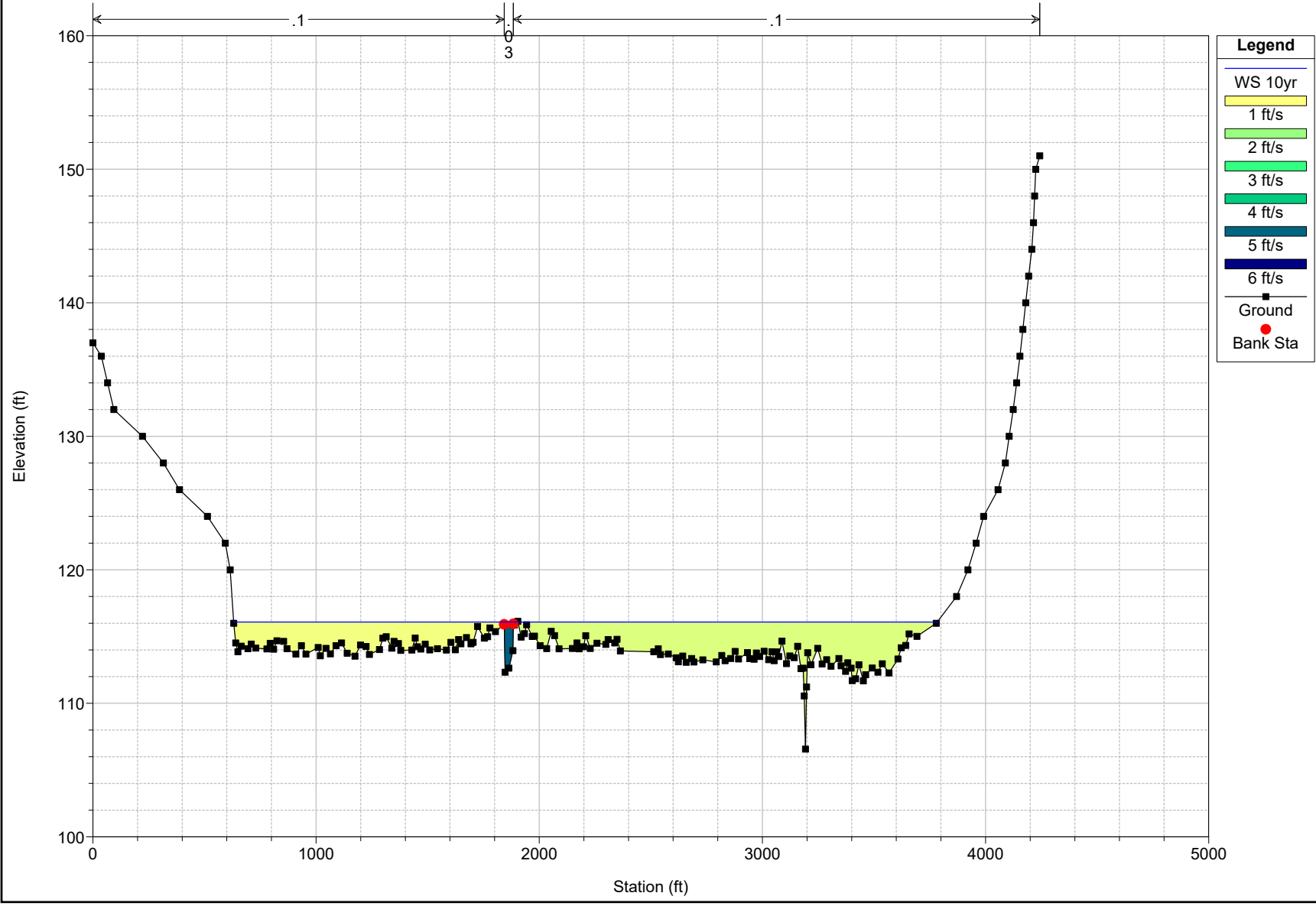
Patuxent River Plan: Plan 04 6/5/2019  
RS = 192774.7



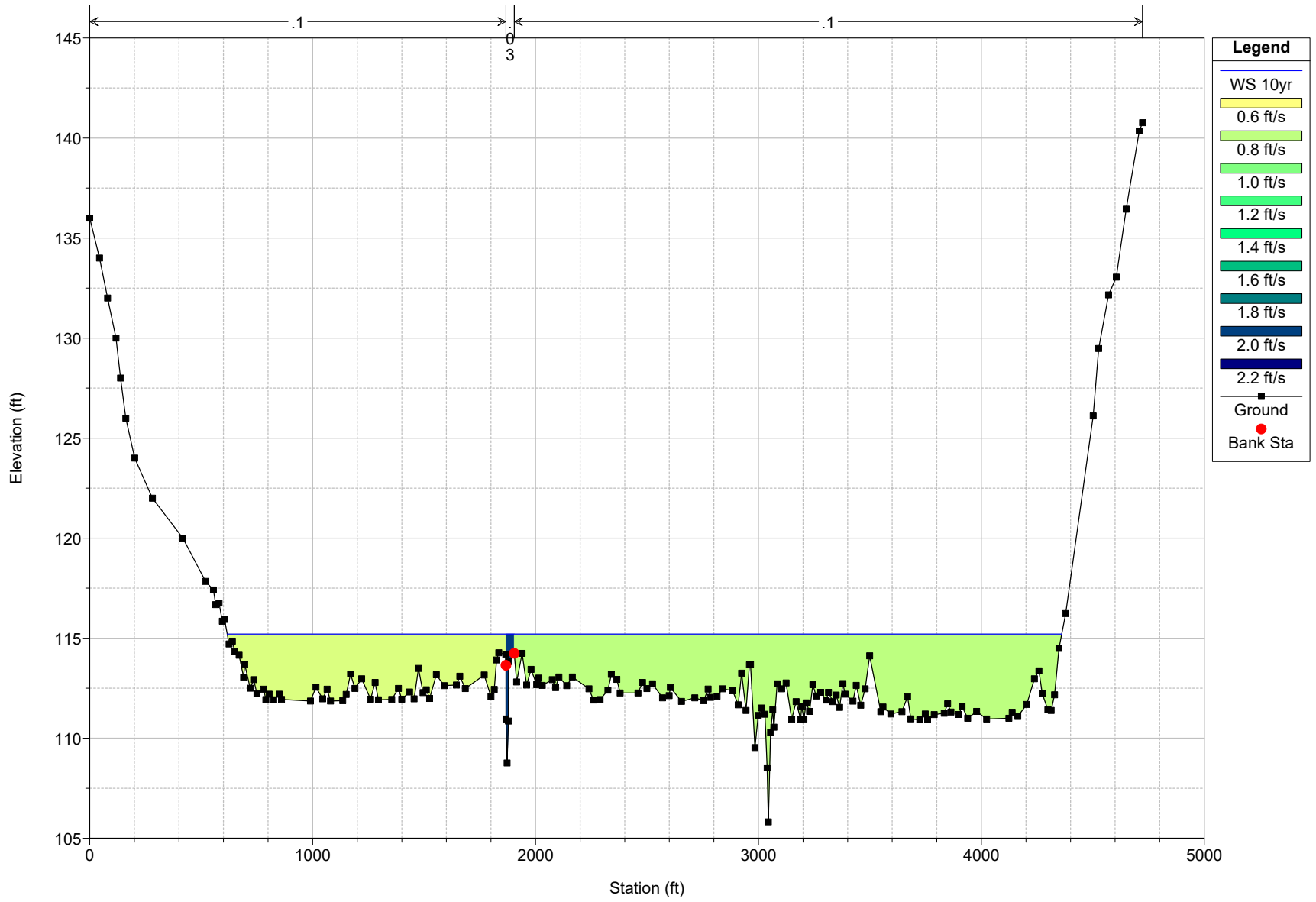
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 192514.9



Patuxent River Plan: Plan 04 6/5/2019  
RS = 191681.5



Patuxent River Plan: Plan 04 6/5/2019  
RS = 190879.0





## **Appendix C**

### **Existing 100-yr Storm Cross Sections with**

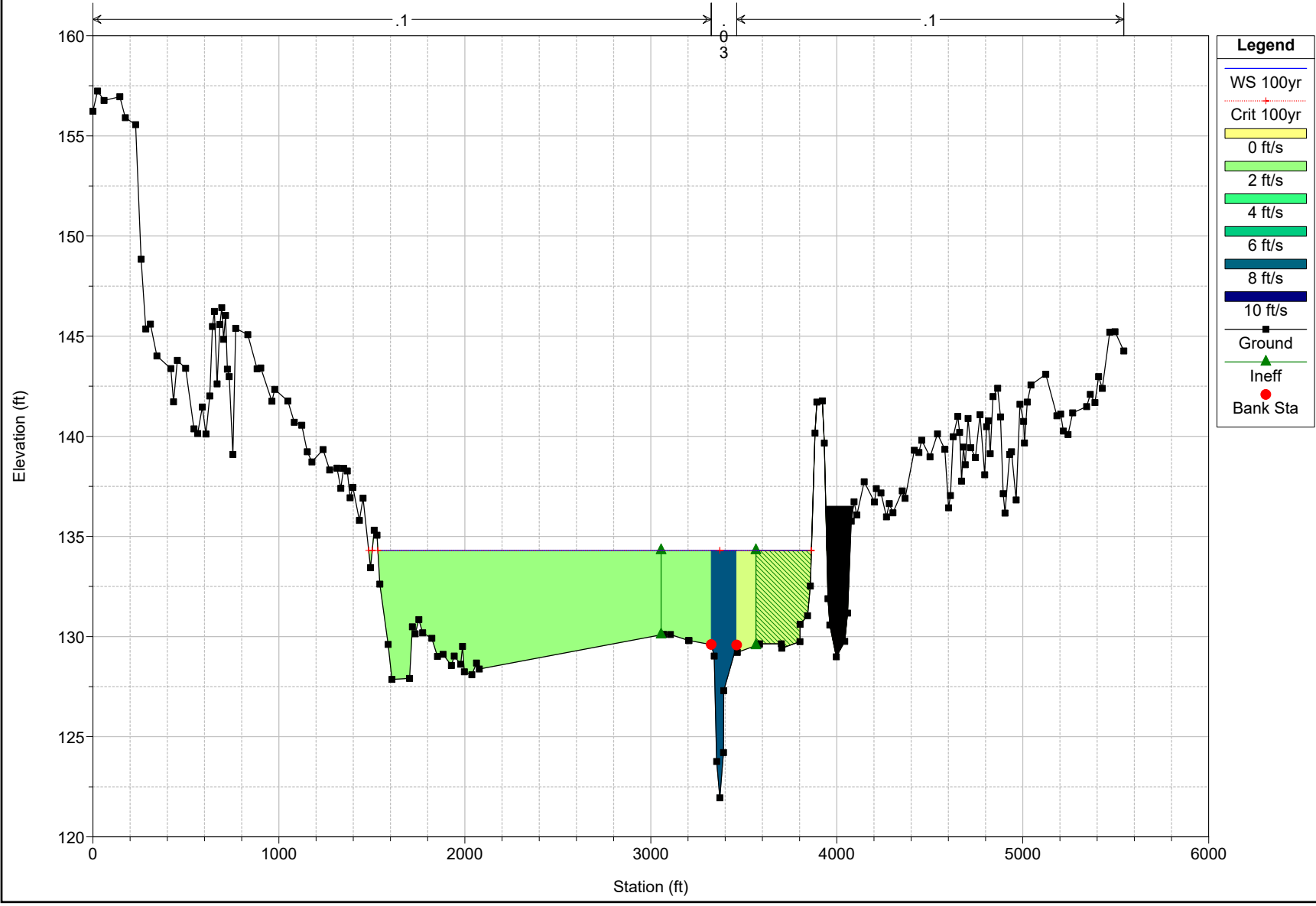
### **Velocity**

# Existing 100-yr Storm Cross Sections with Velocity

(Without Berm)

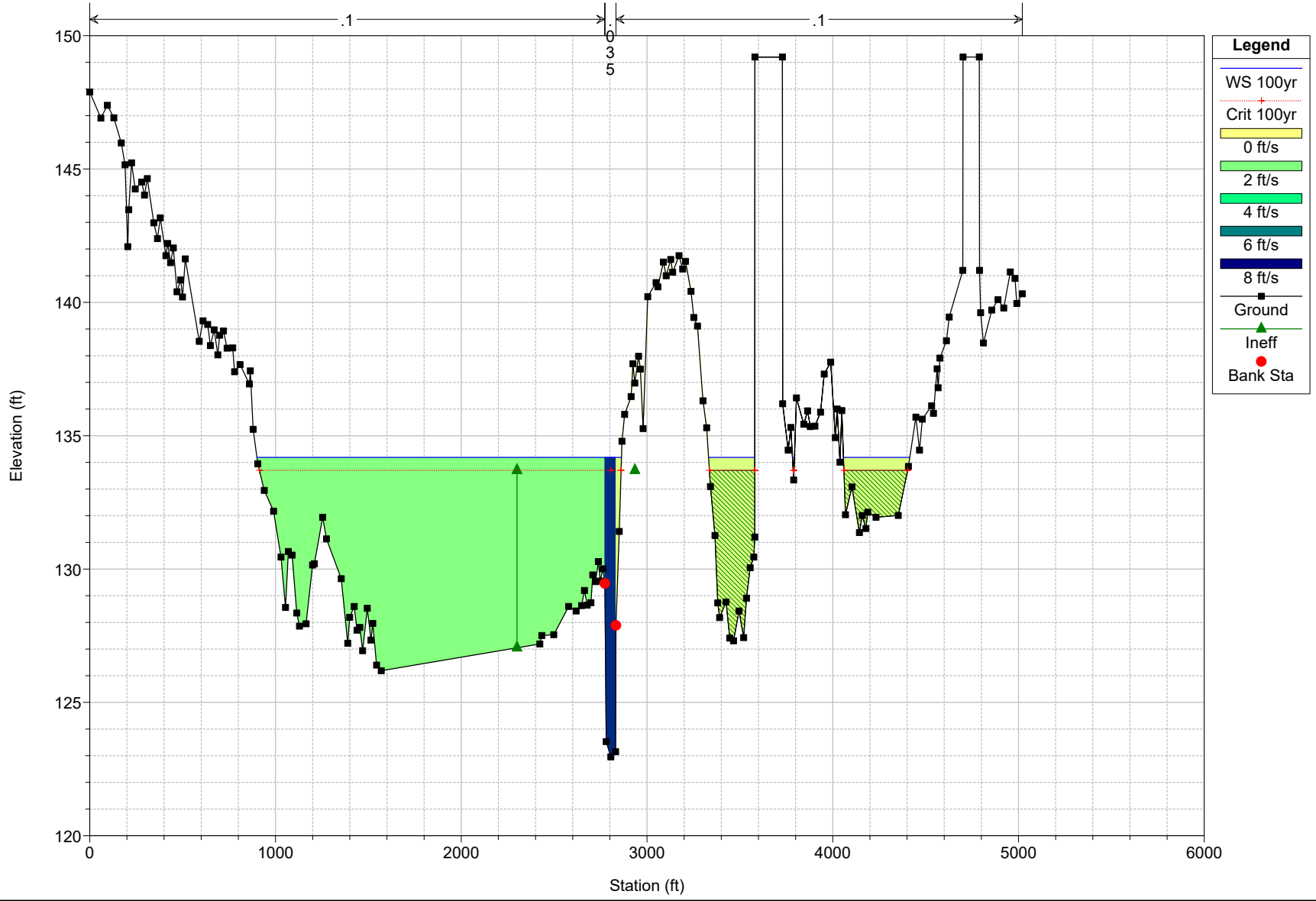
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

RS = 201119

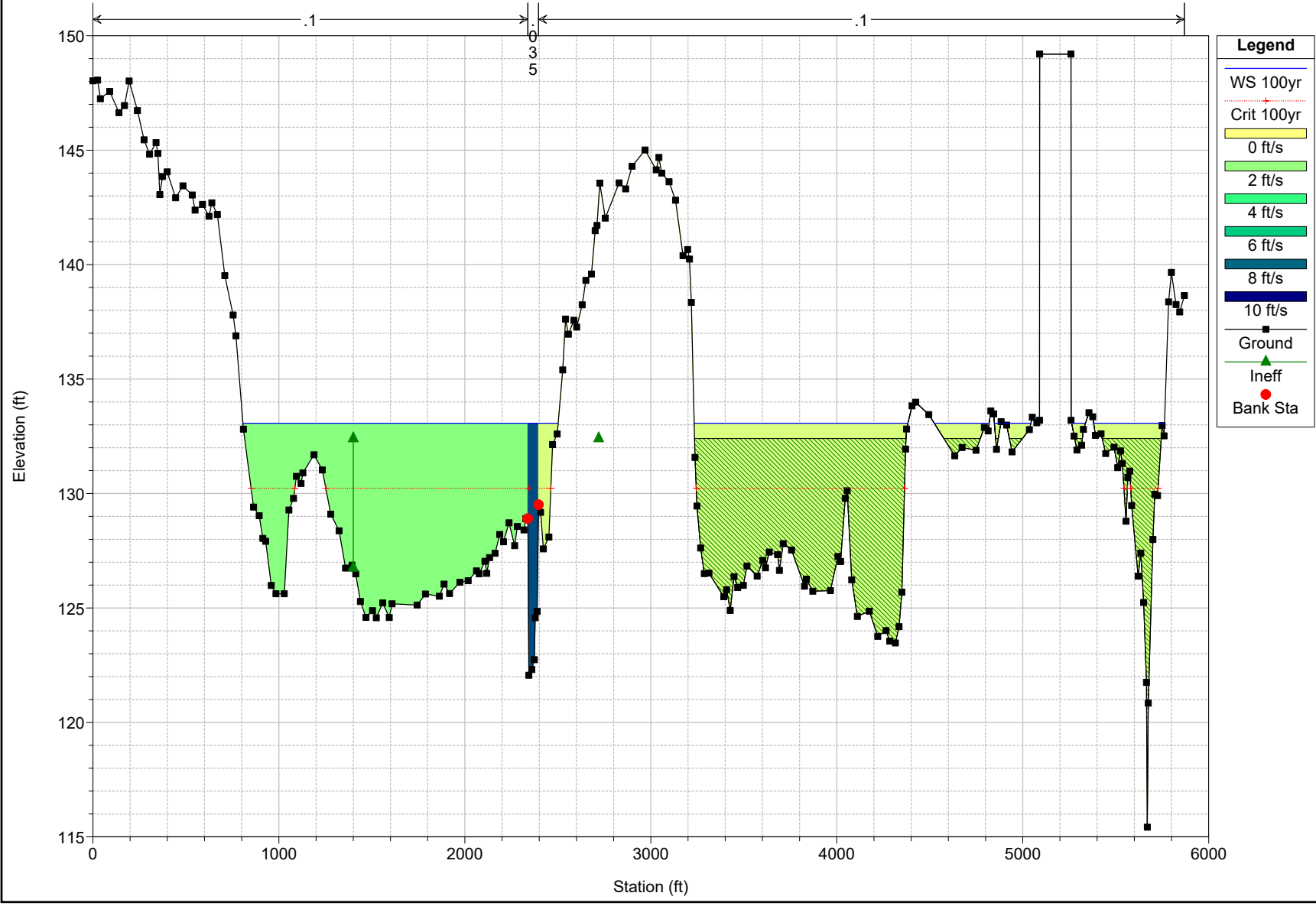


Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

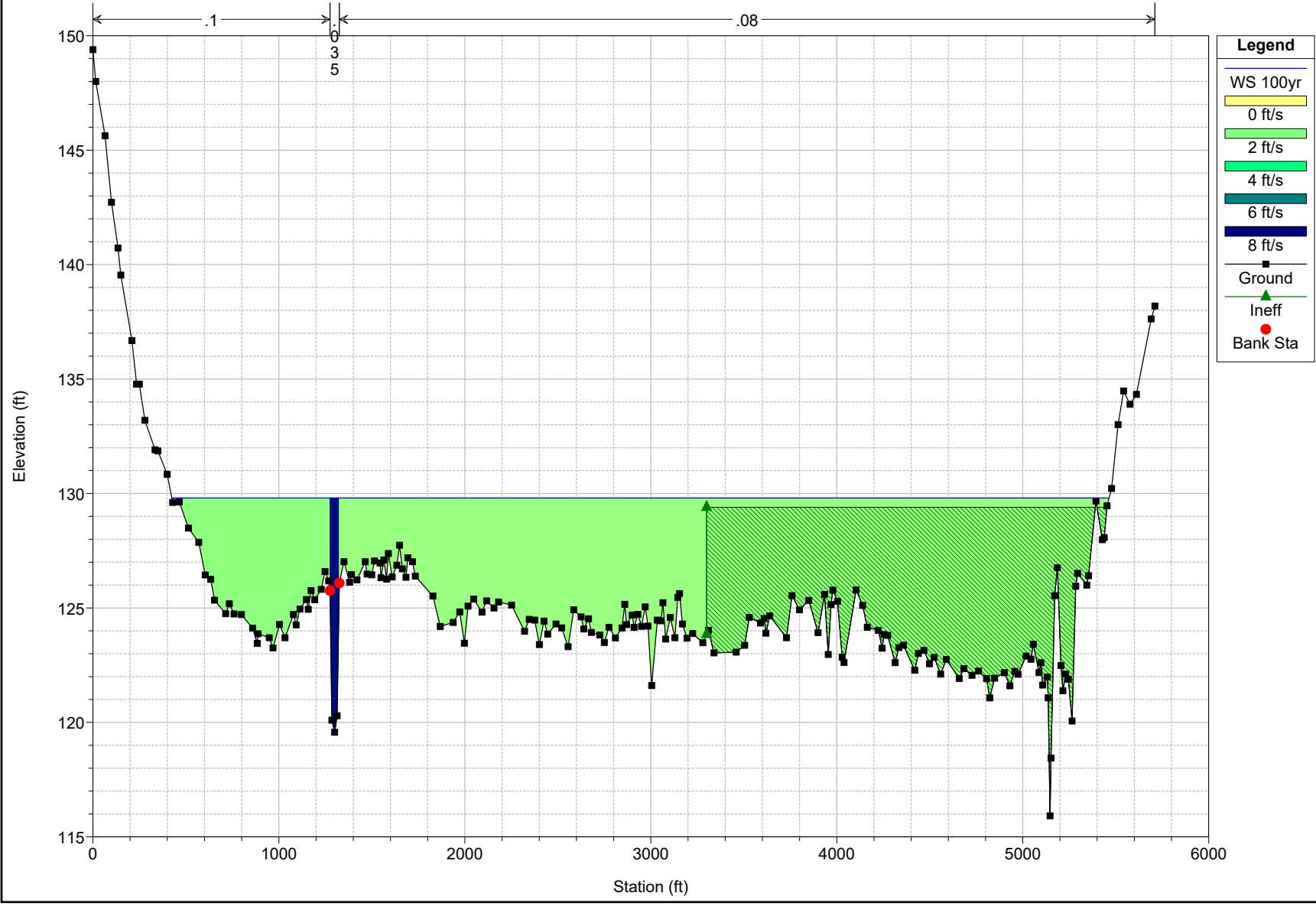
RS = 201058.7



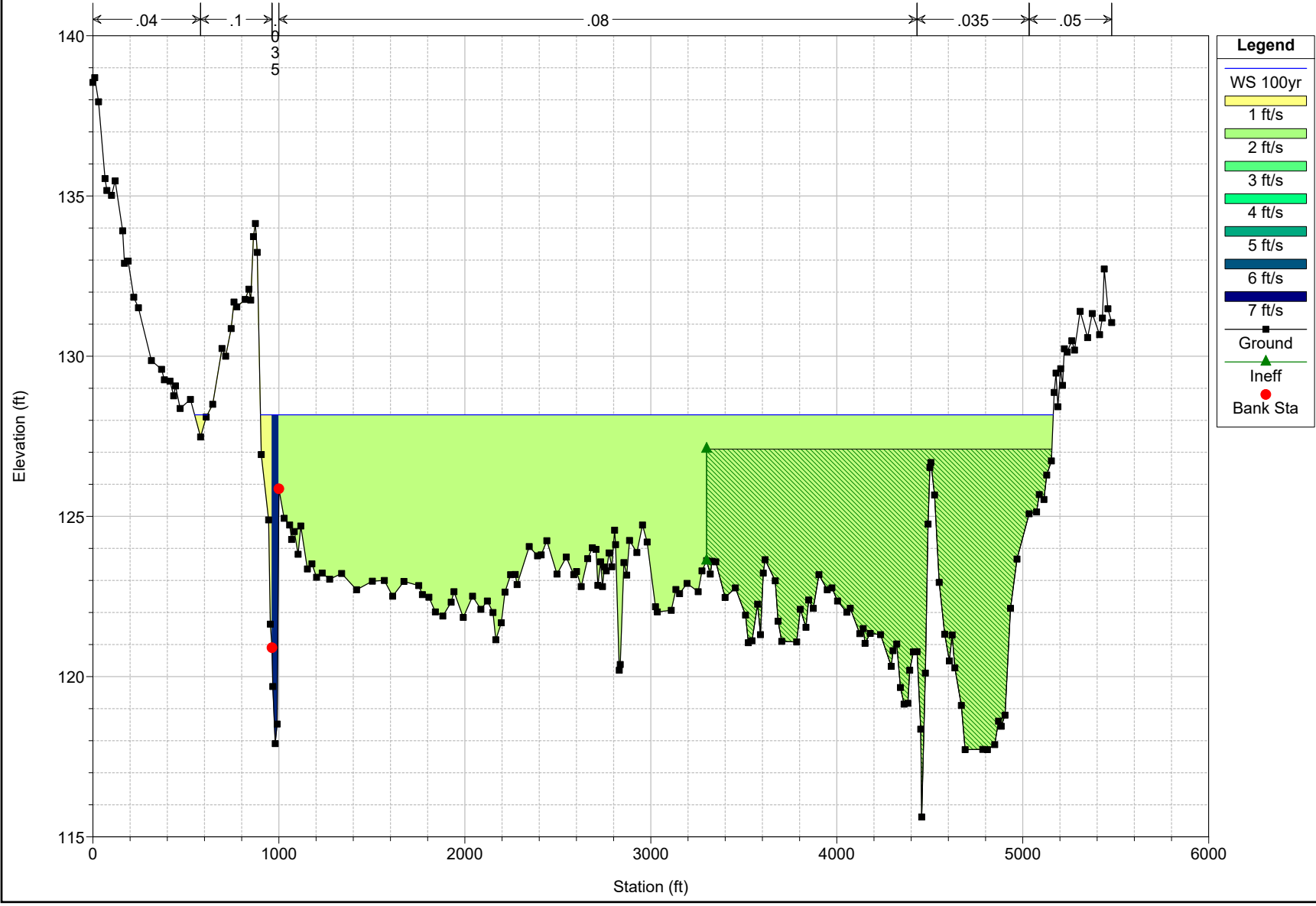
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 200115.4



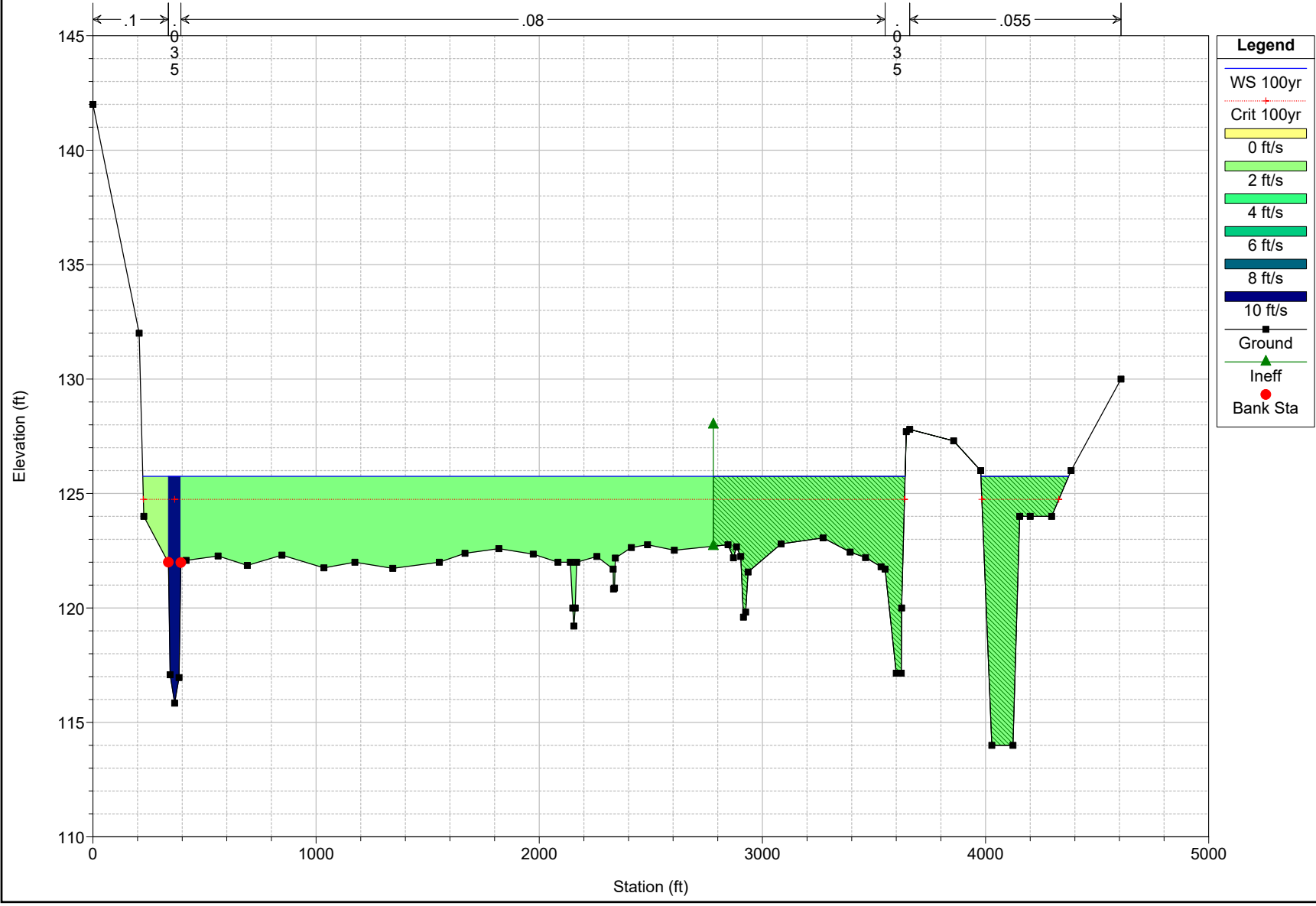
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 198588.0



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 197599.6

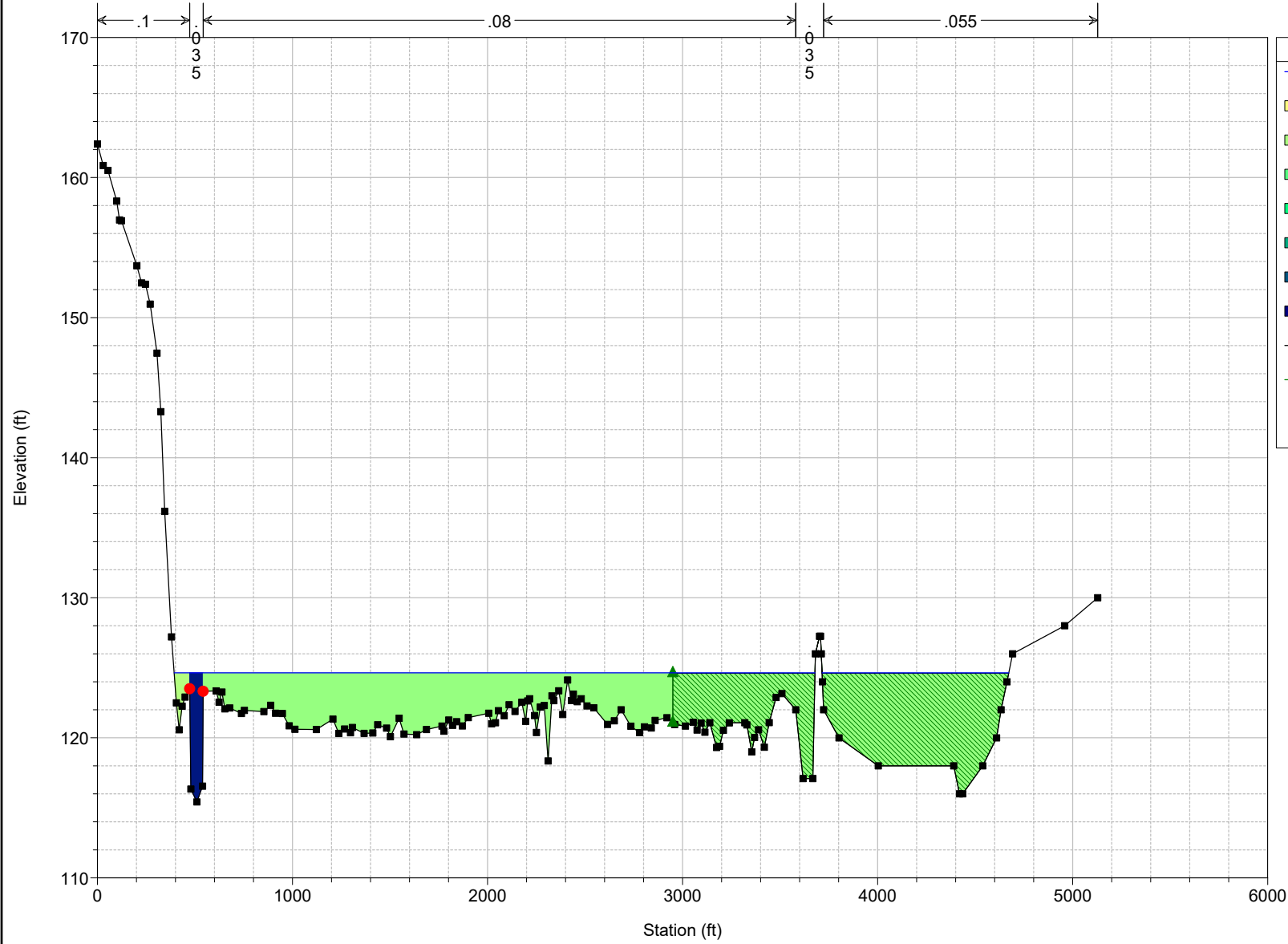


Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 196568.8





Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 196356.8

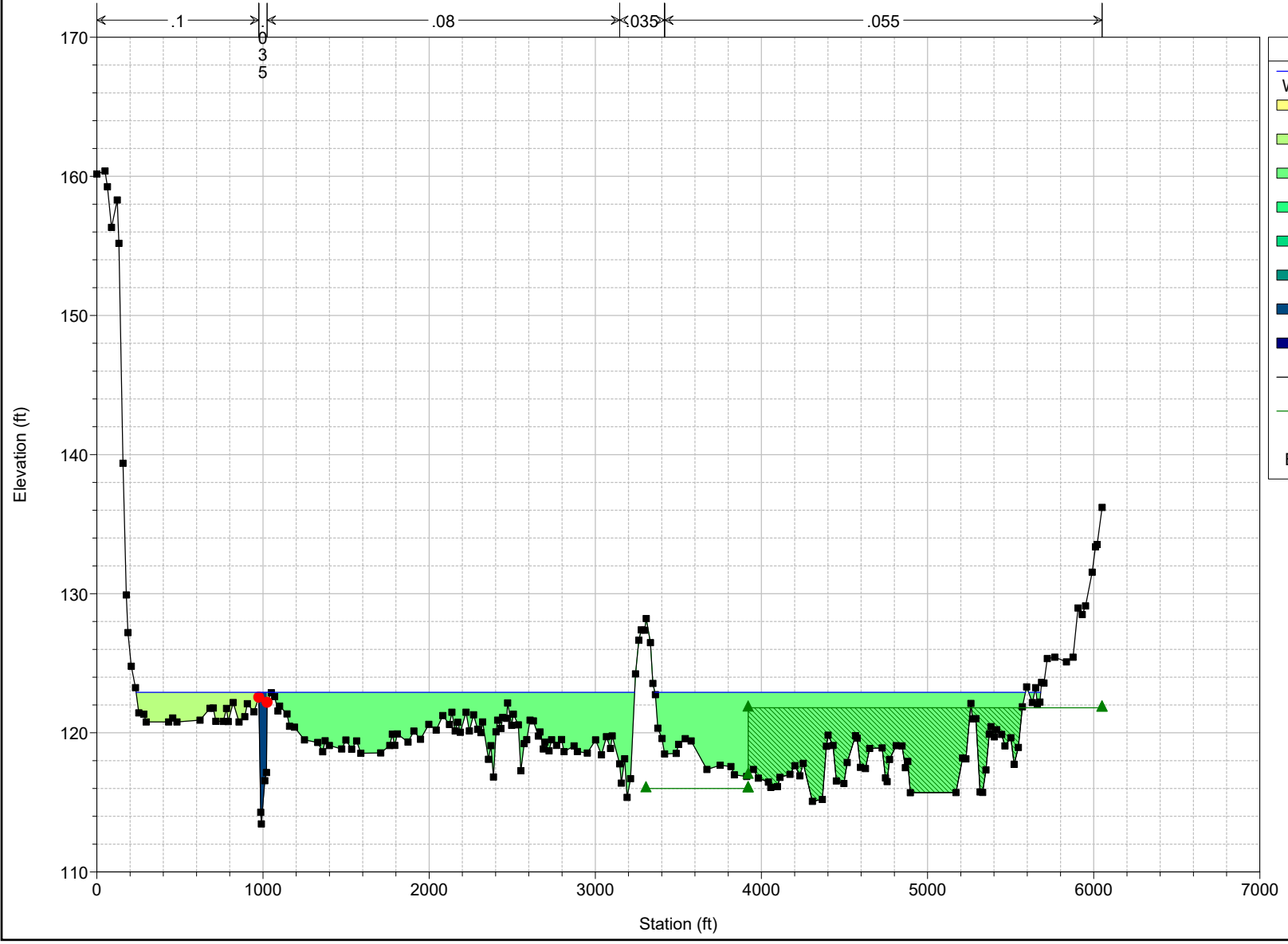


**Legend**

- WS 100yr
- 0 ft/s
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- 12 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019

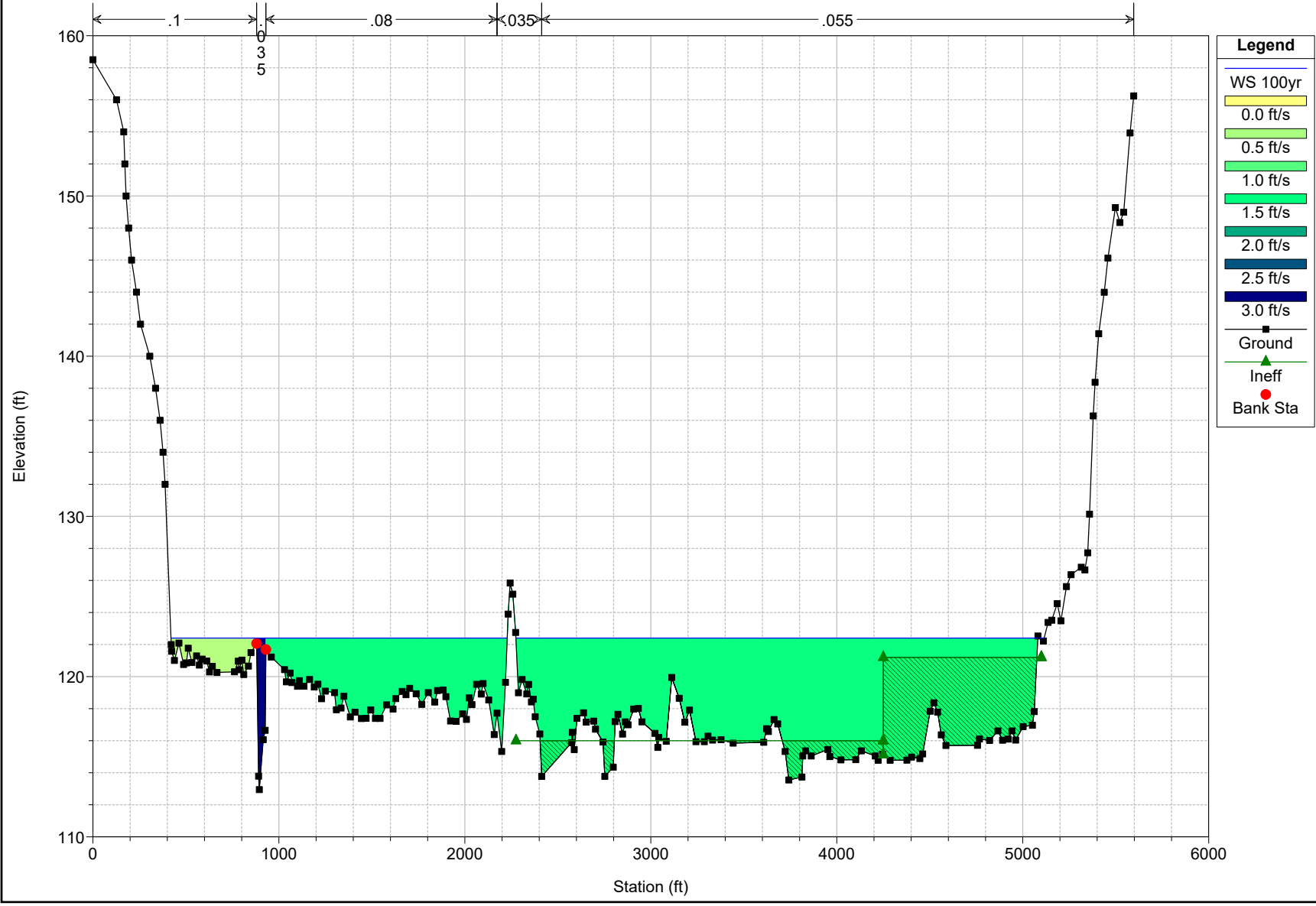
RS = 195583.1



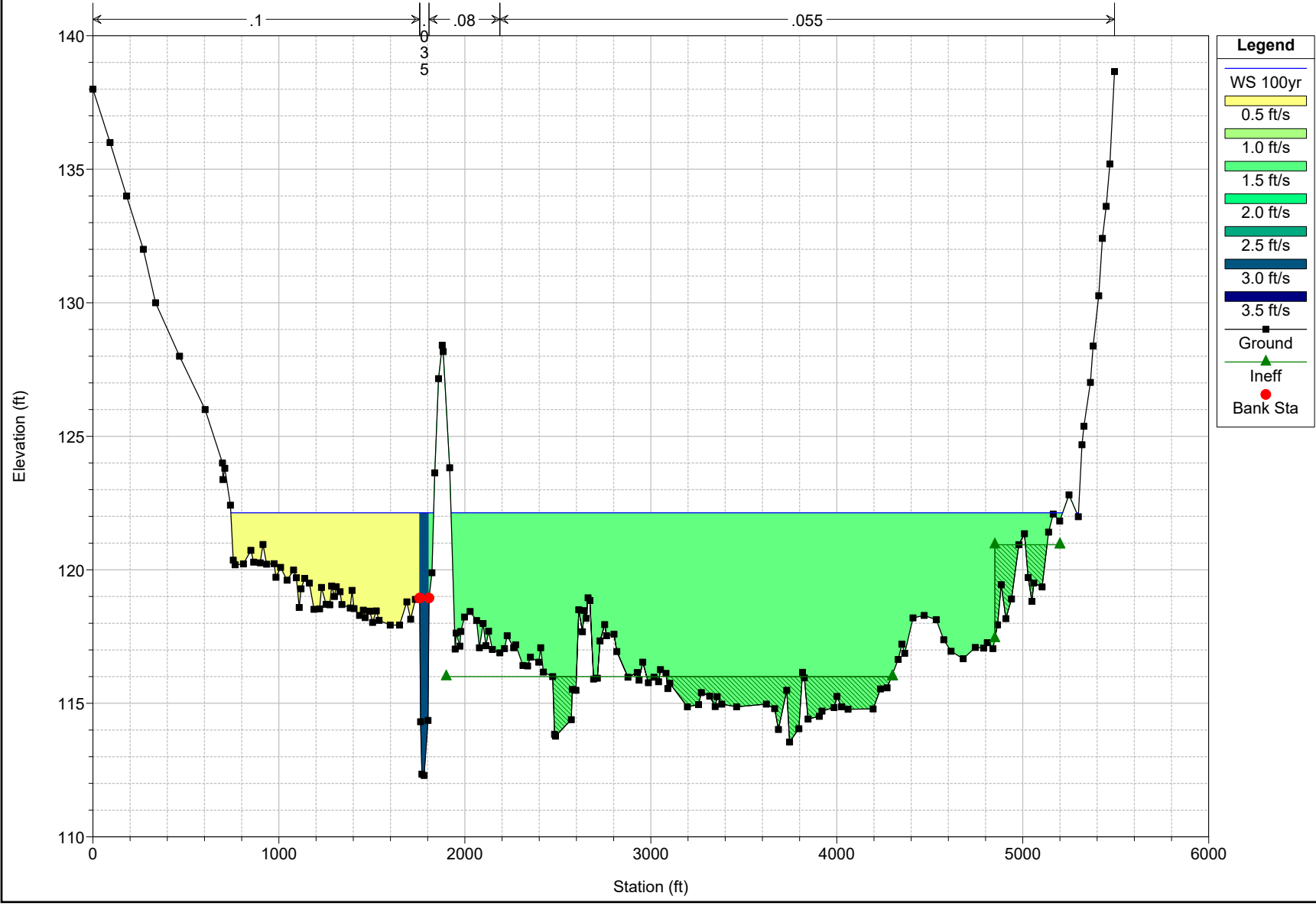
**Legend**

- WS 100yr
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

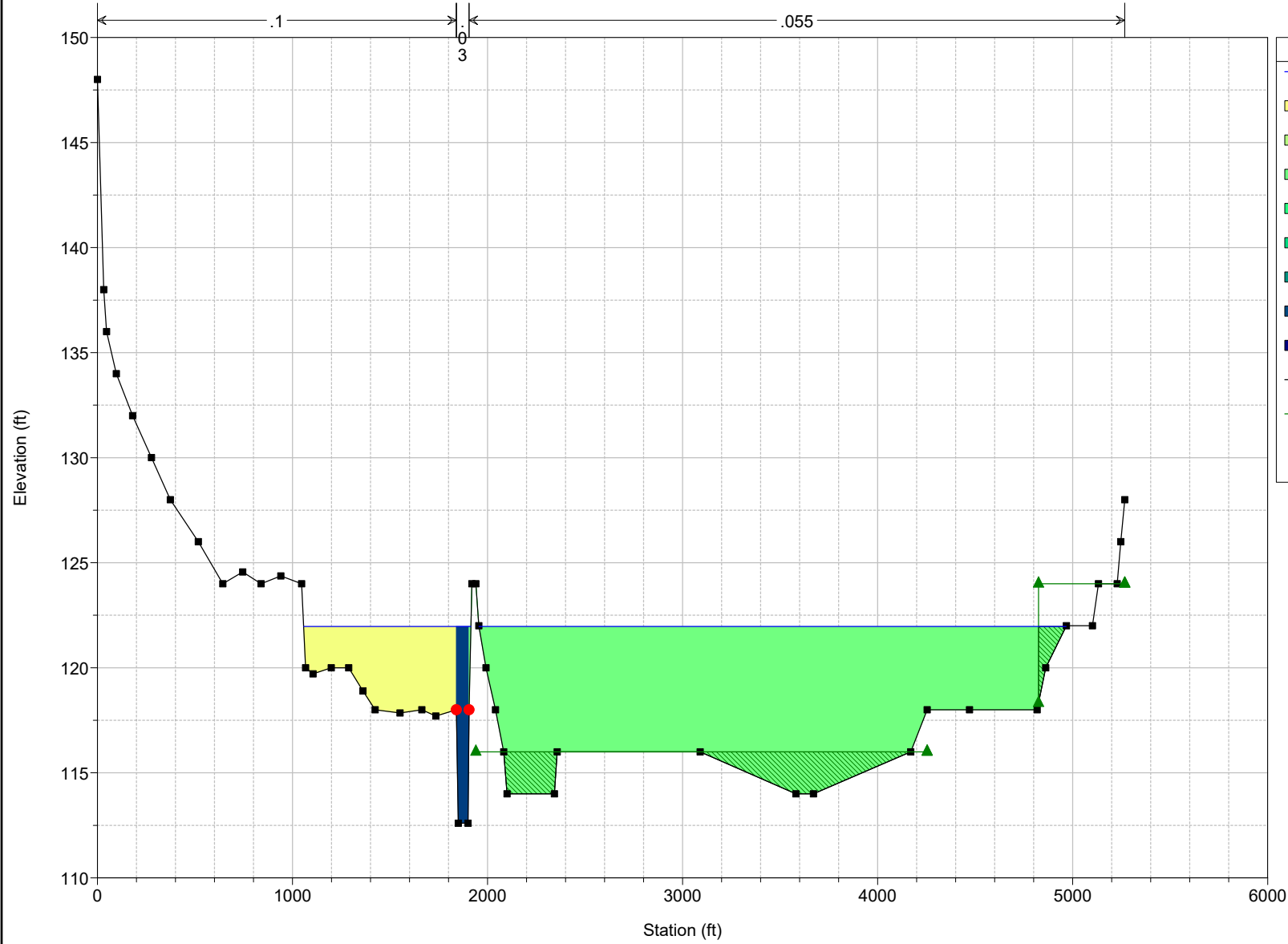
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 194817.8



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 193854.4



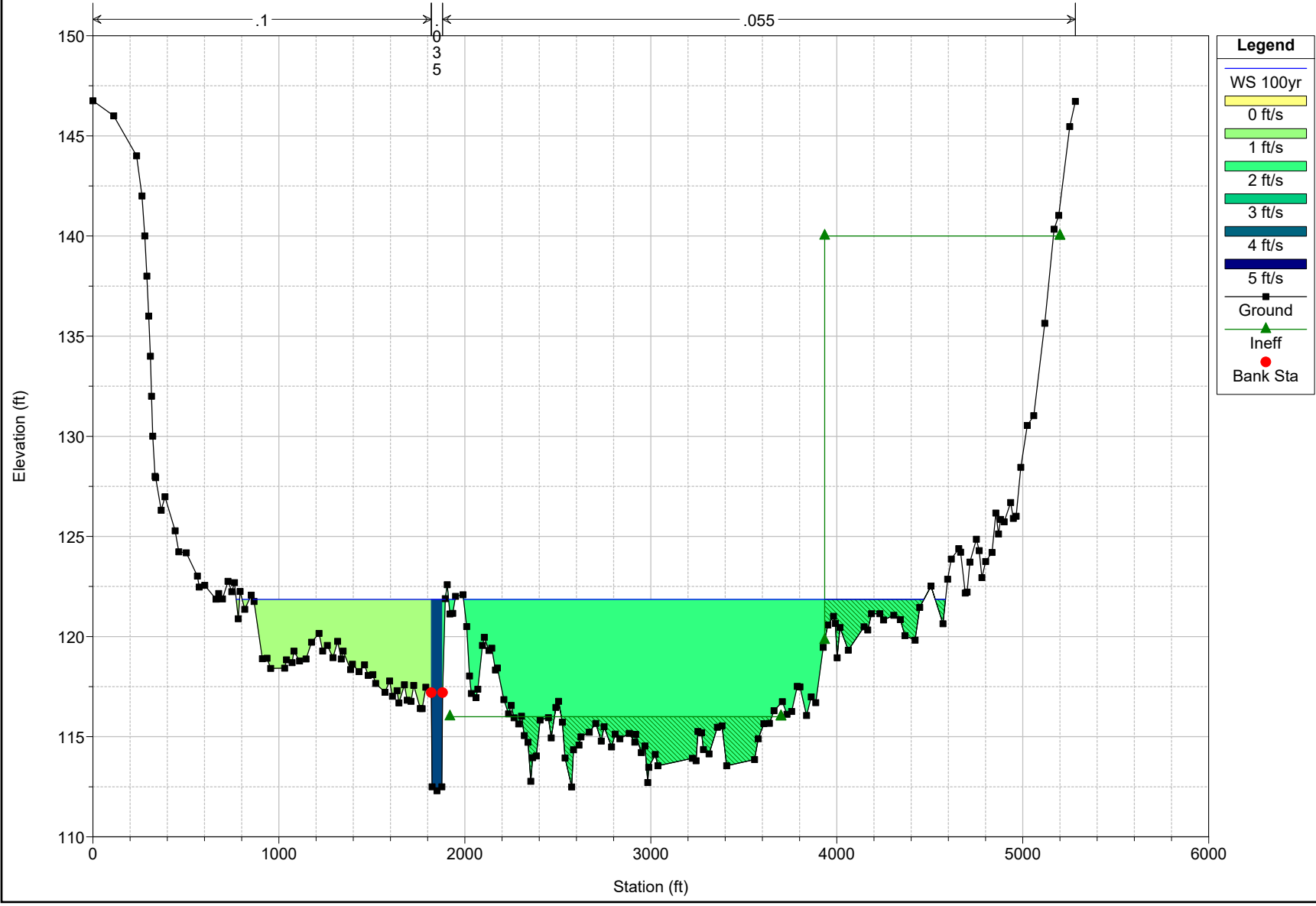
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 193357.9



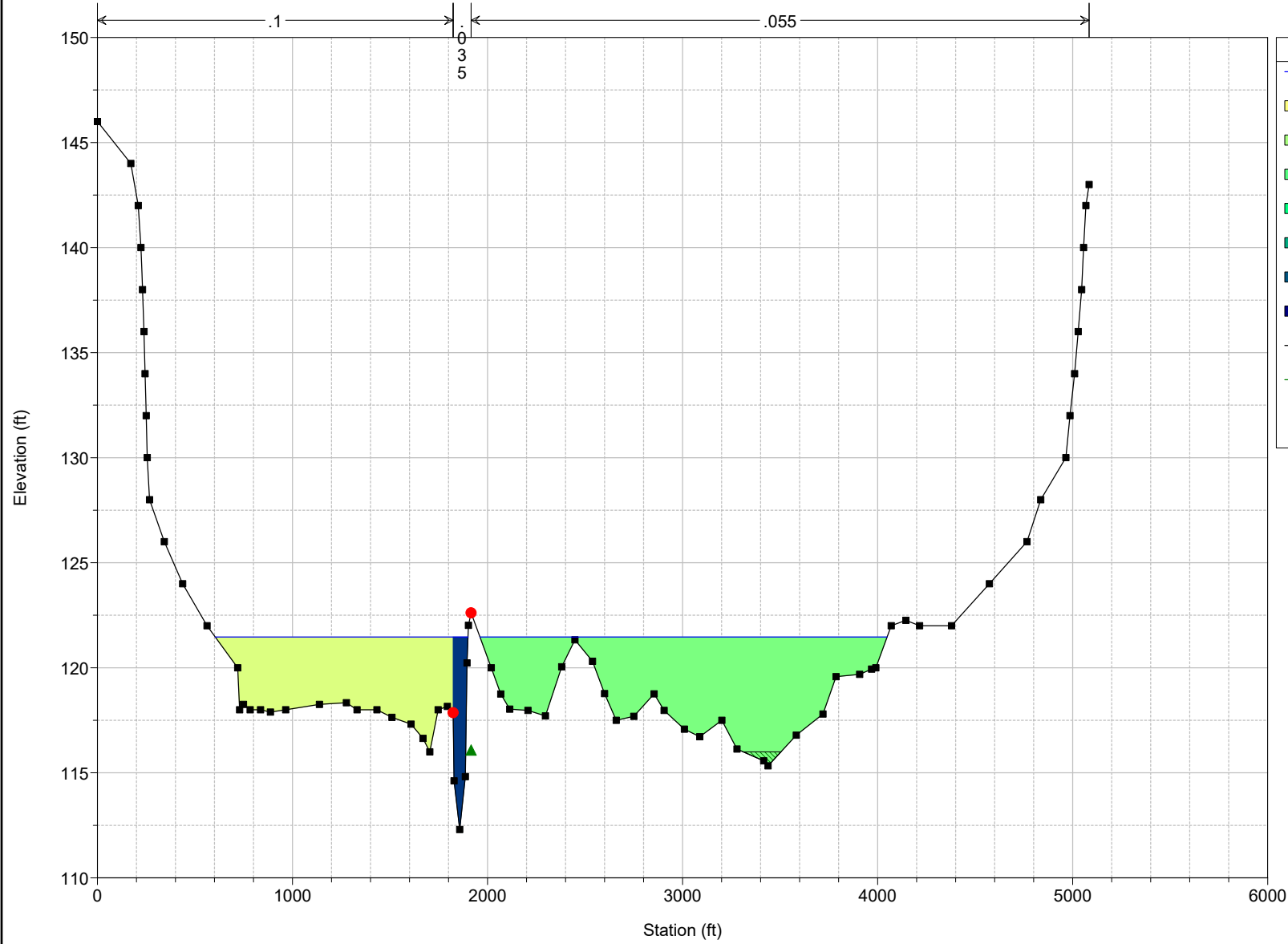
**Legend**

- WS 100yr
- 0.5 ft/s
- 1.0 ft/s
- 1.5 ft/s
- 2.0 ft/s
- 2.5 ft/s
- 3.0 ft/s
- 3.5 ft/s
- 4.0 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 193176.6



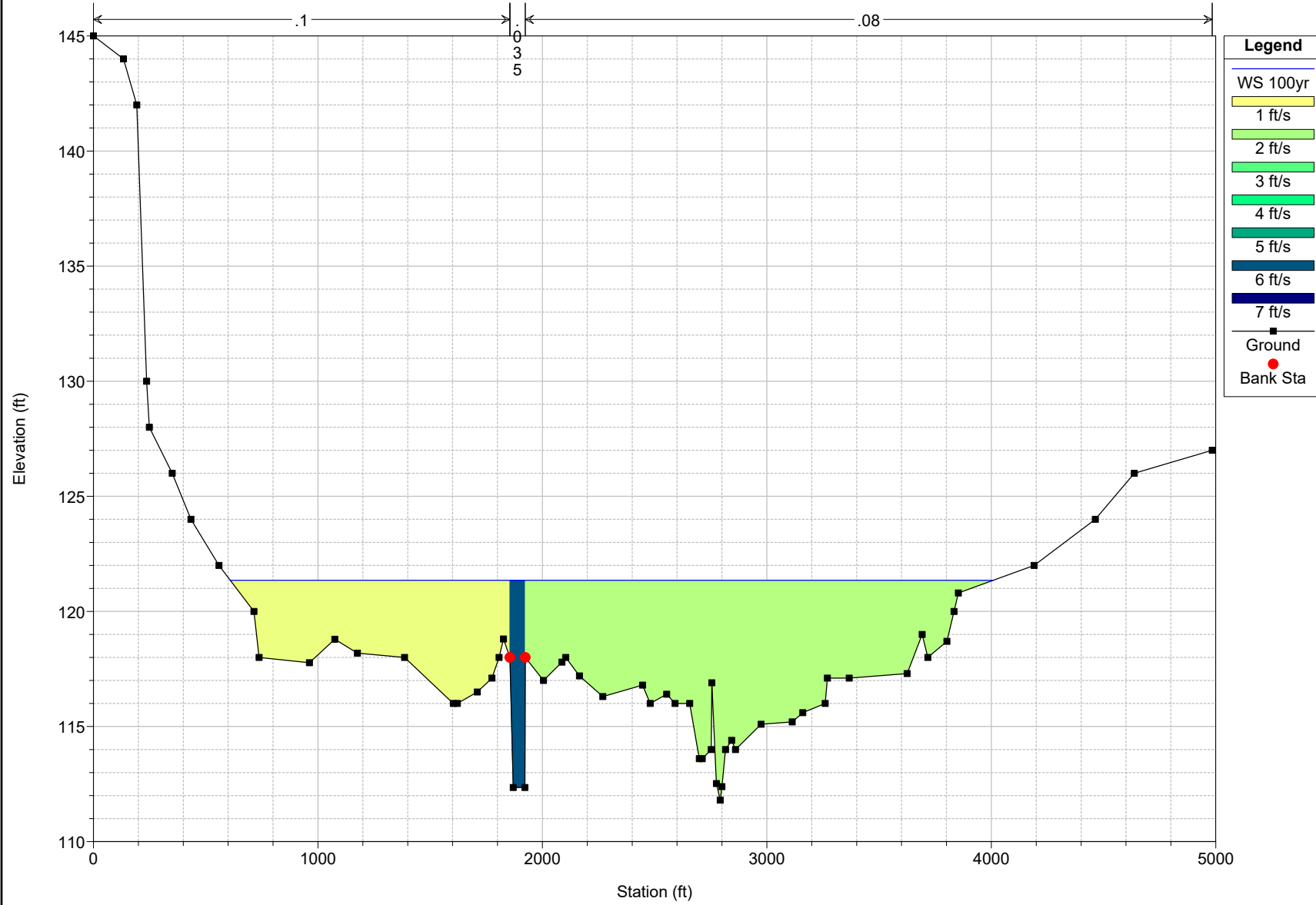
Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 192867



**Legend**

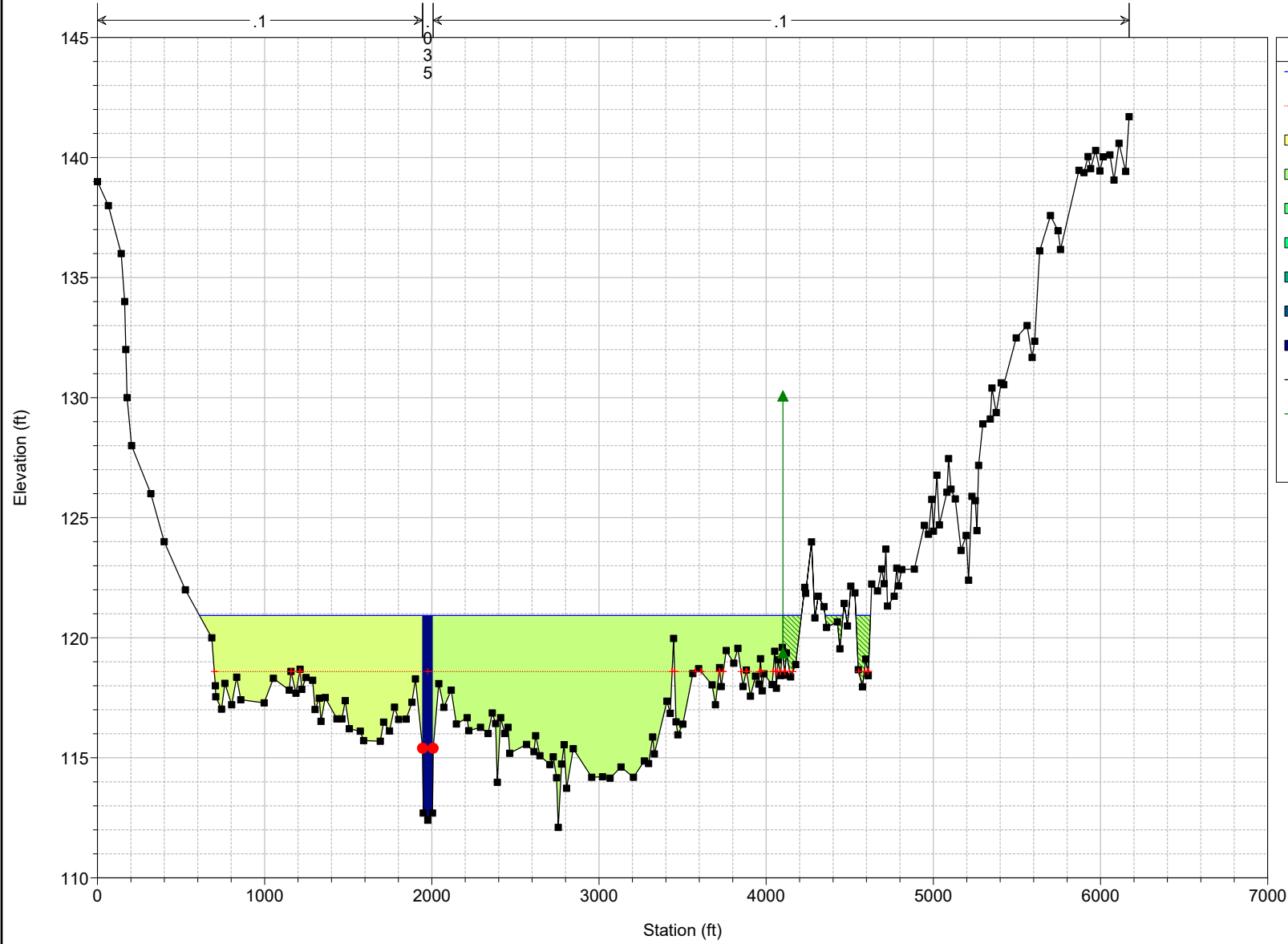
- WS 100yr
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 192774.7



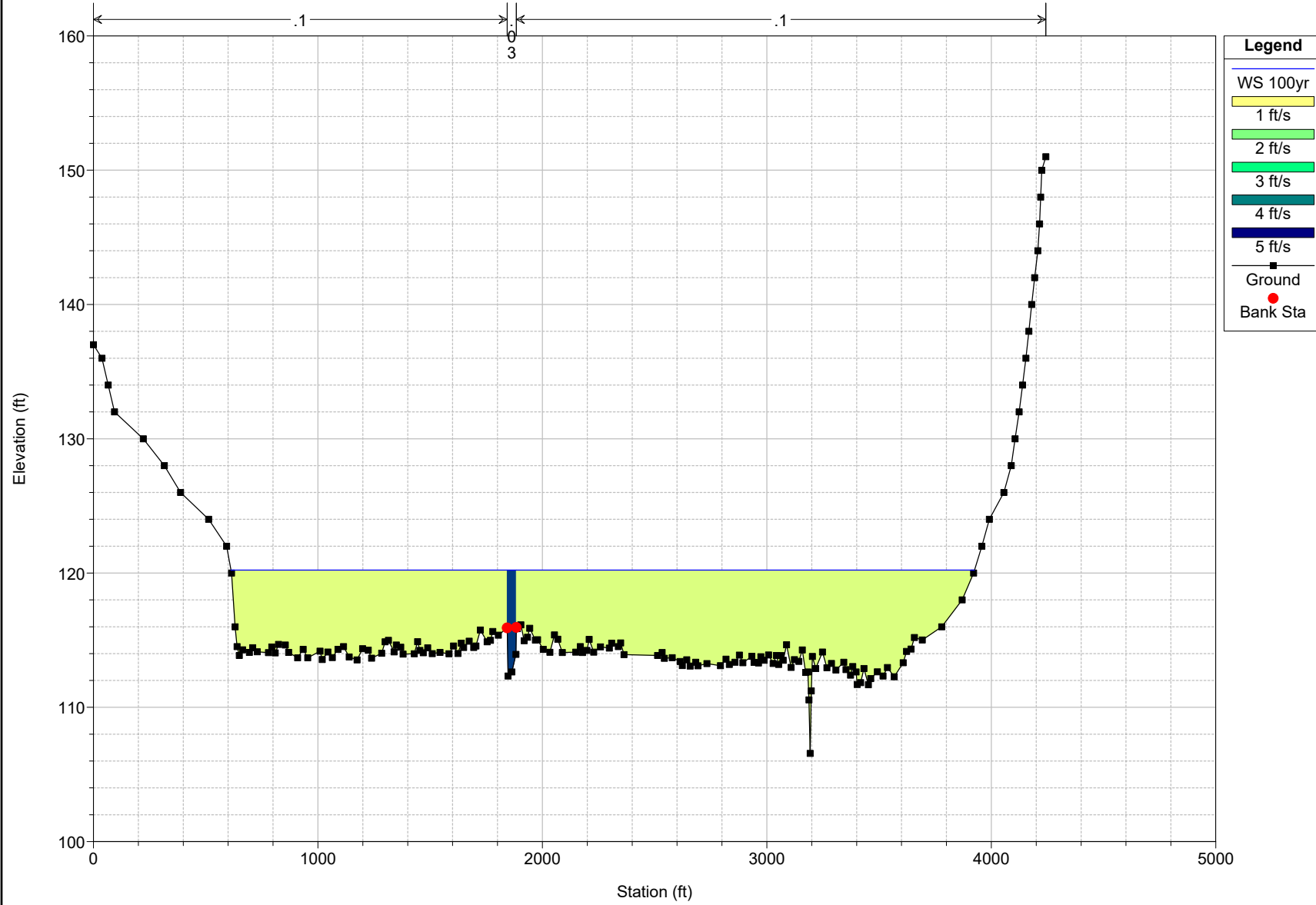


Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
 RS = 192514.9

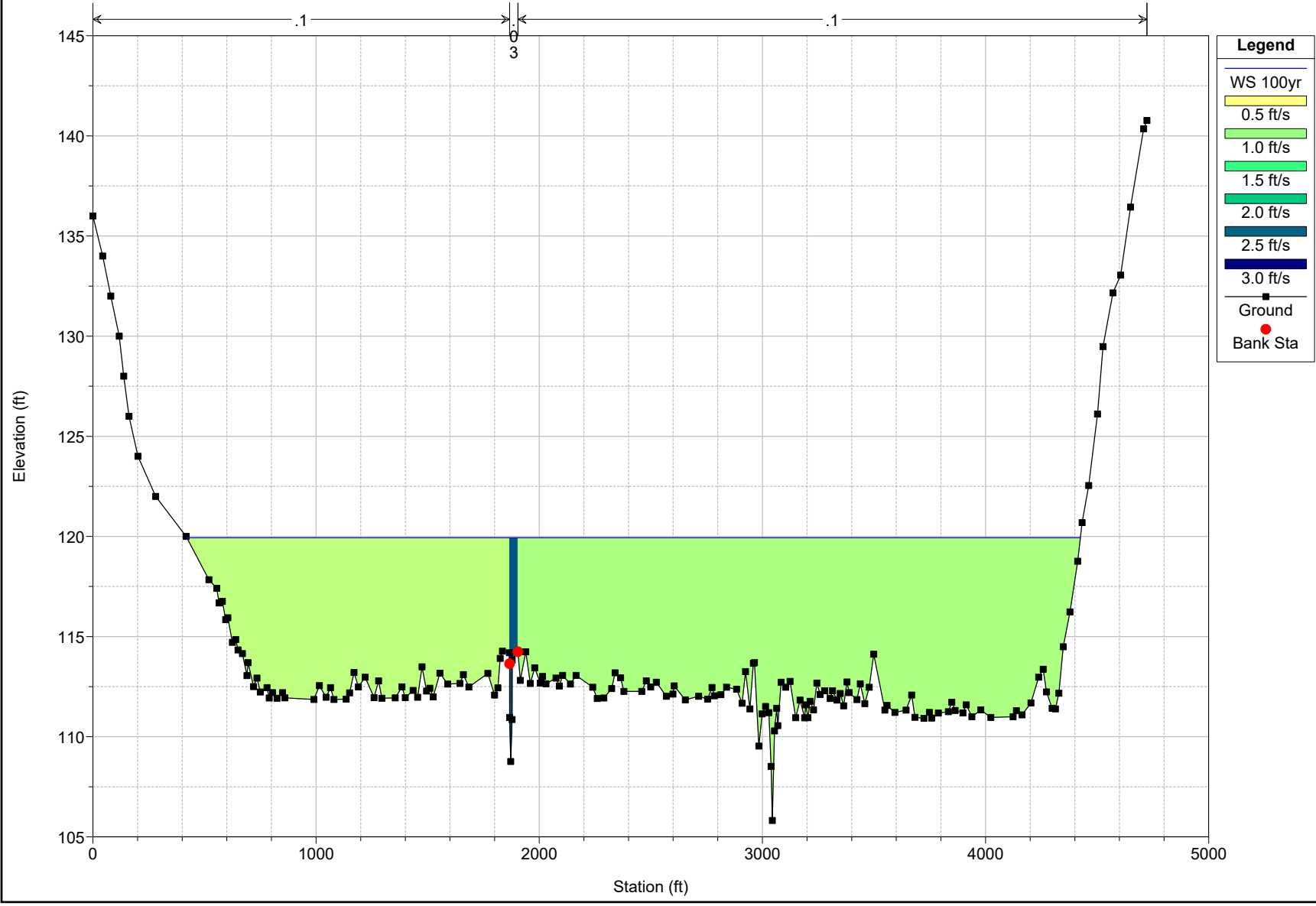


Legend	
WS 100yr	— (Solid Blue Line)
Crit 100yr	- - - (Red Dashed Line)
1 ft/s	■ (Yellow)
2 ft/s	■ (Light Green)
3 ft/s	■ (Medium Green)
4 ft/s	■ (Dark Green)
5 ft/s	■ (Teal)
6 ft/s	■ (Dark Blue)
7 ft/s	■ (Navy Blue)
Ground	■ (Black Square)
Ineff	▲ (Green Triangle)
Bank Sta	● (Red Circle)

Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 191681.5



Patuxent River Plan: Patuxent River - Multiple Run 6/5/2019  
RS = 190879.0

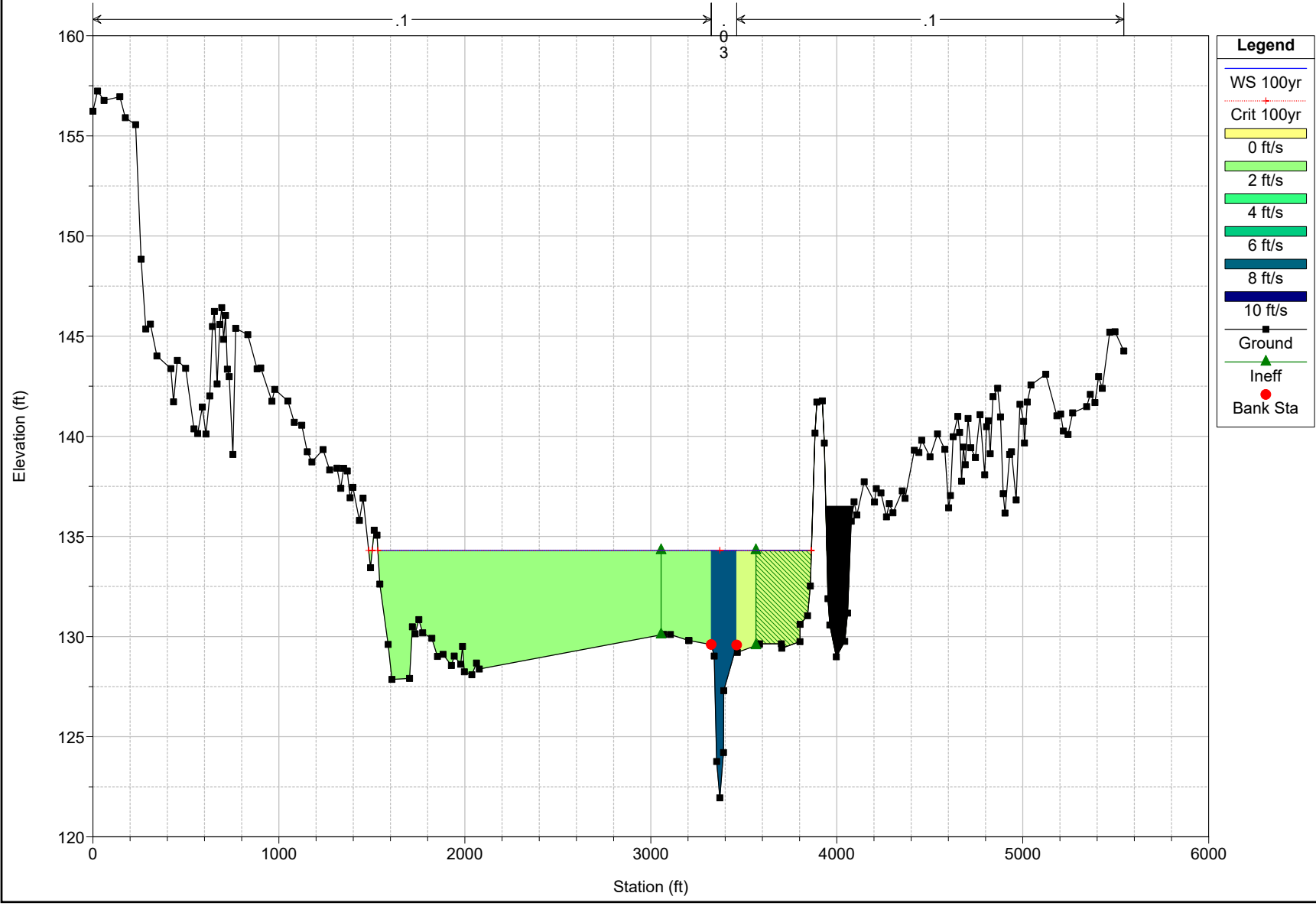


# **Existing 100-yr Storm Cross Sections with Velocity**

**(With Berm)**

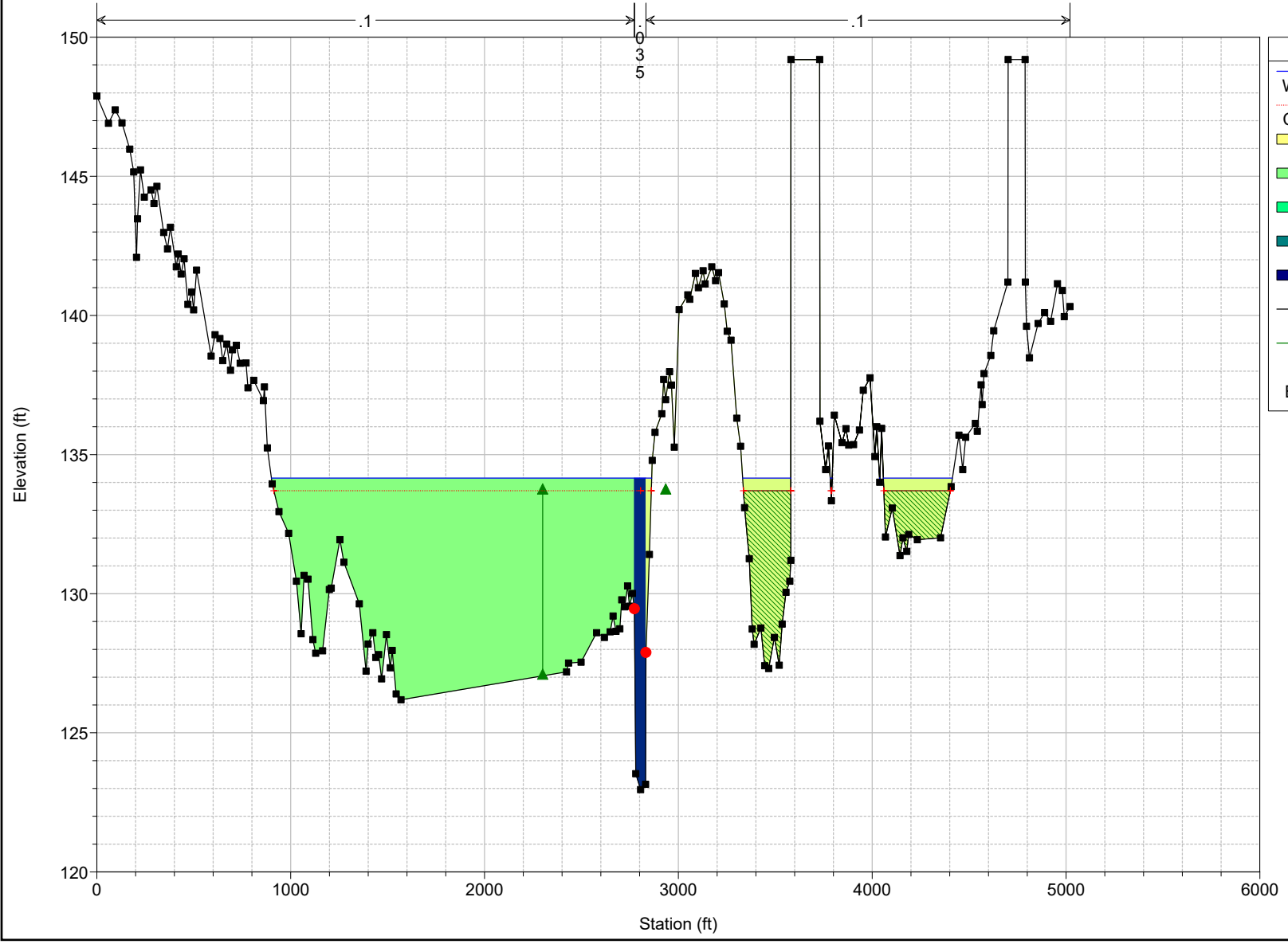
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

RS = 201119

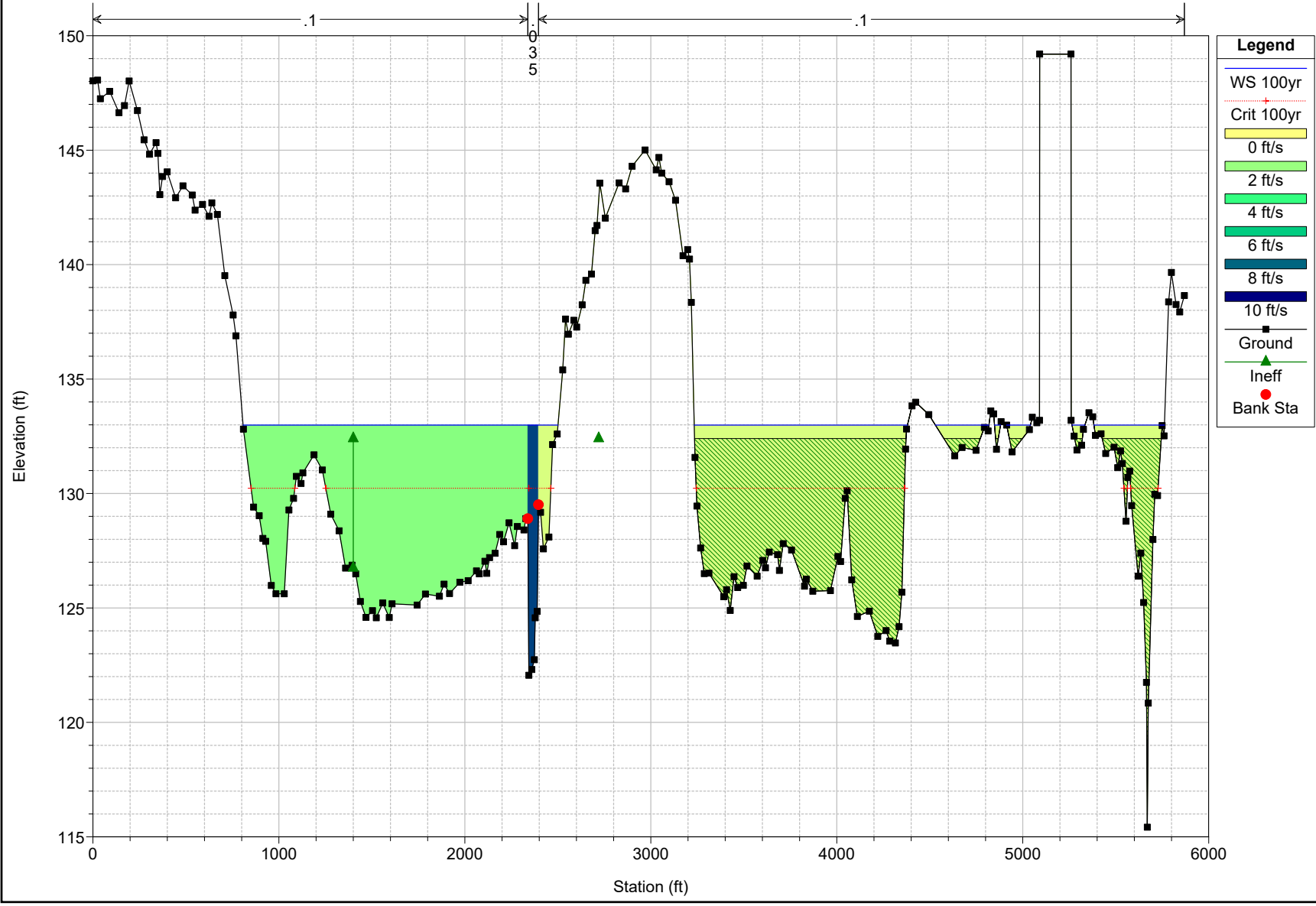


Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

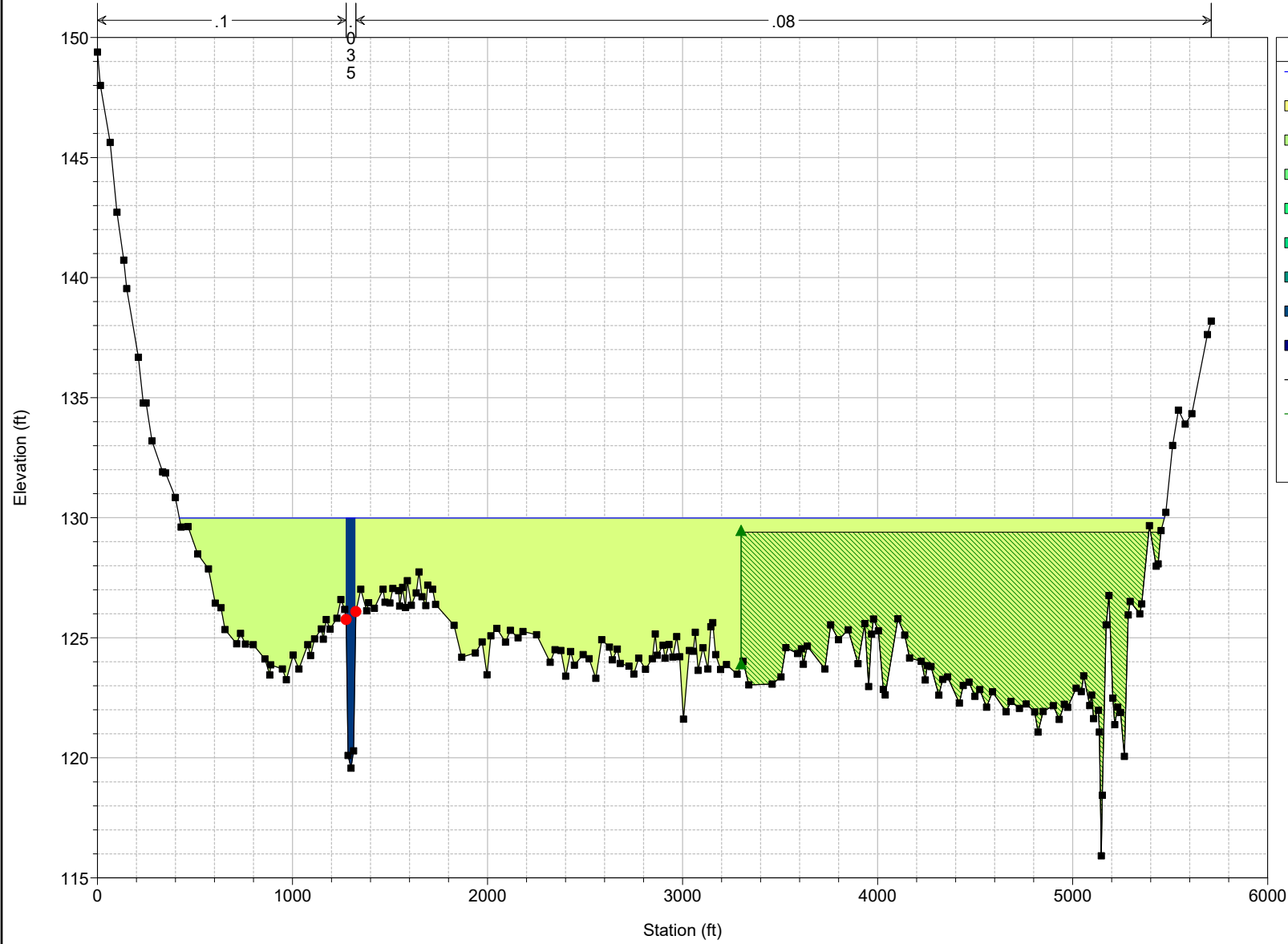
RS = 201058.7



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 200115.4



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 198588.0

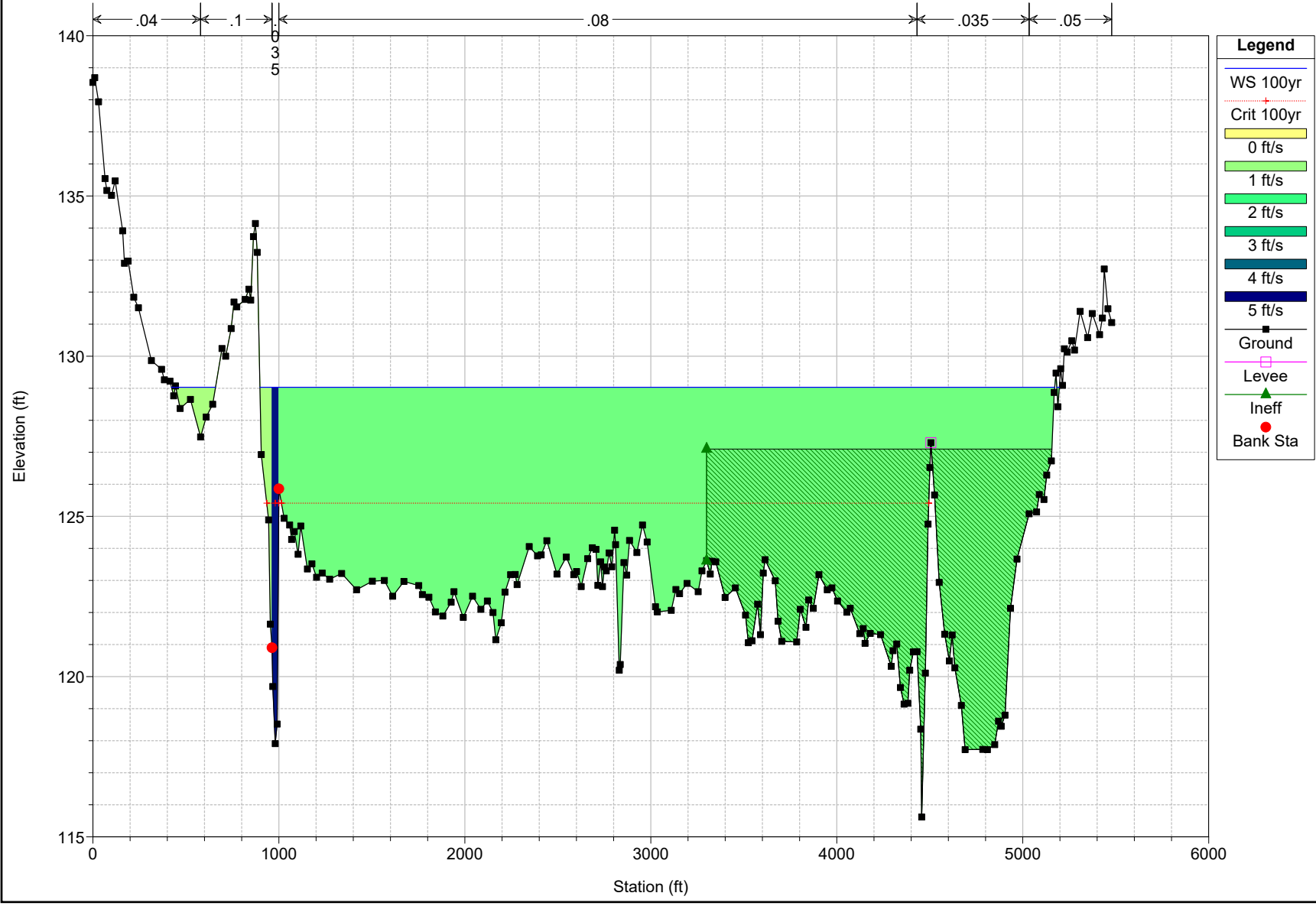


**Legend**

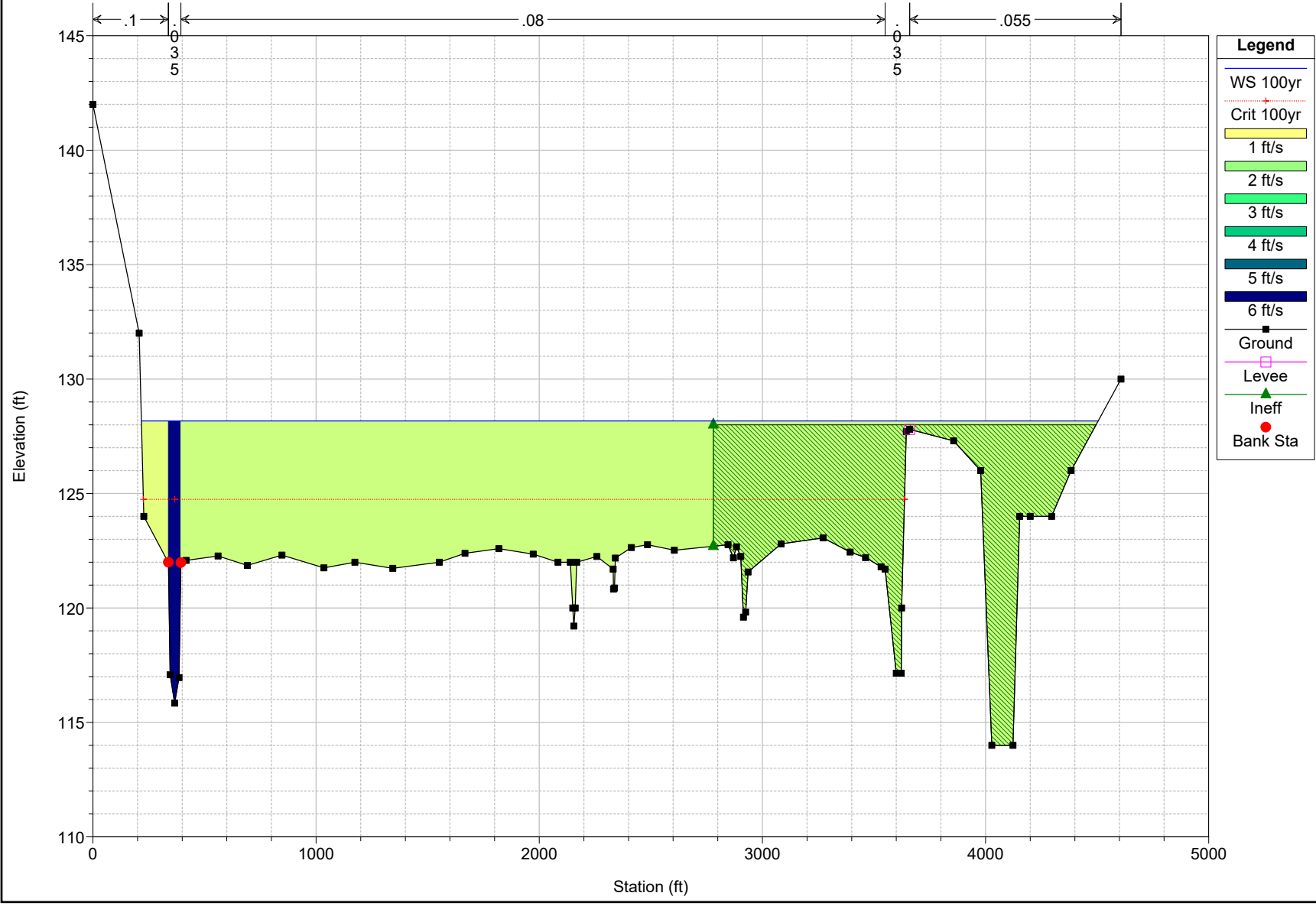
- WS 100yr
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- 8 ft/s
- Ground
- Ineff
- Bank Sta



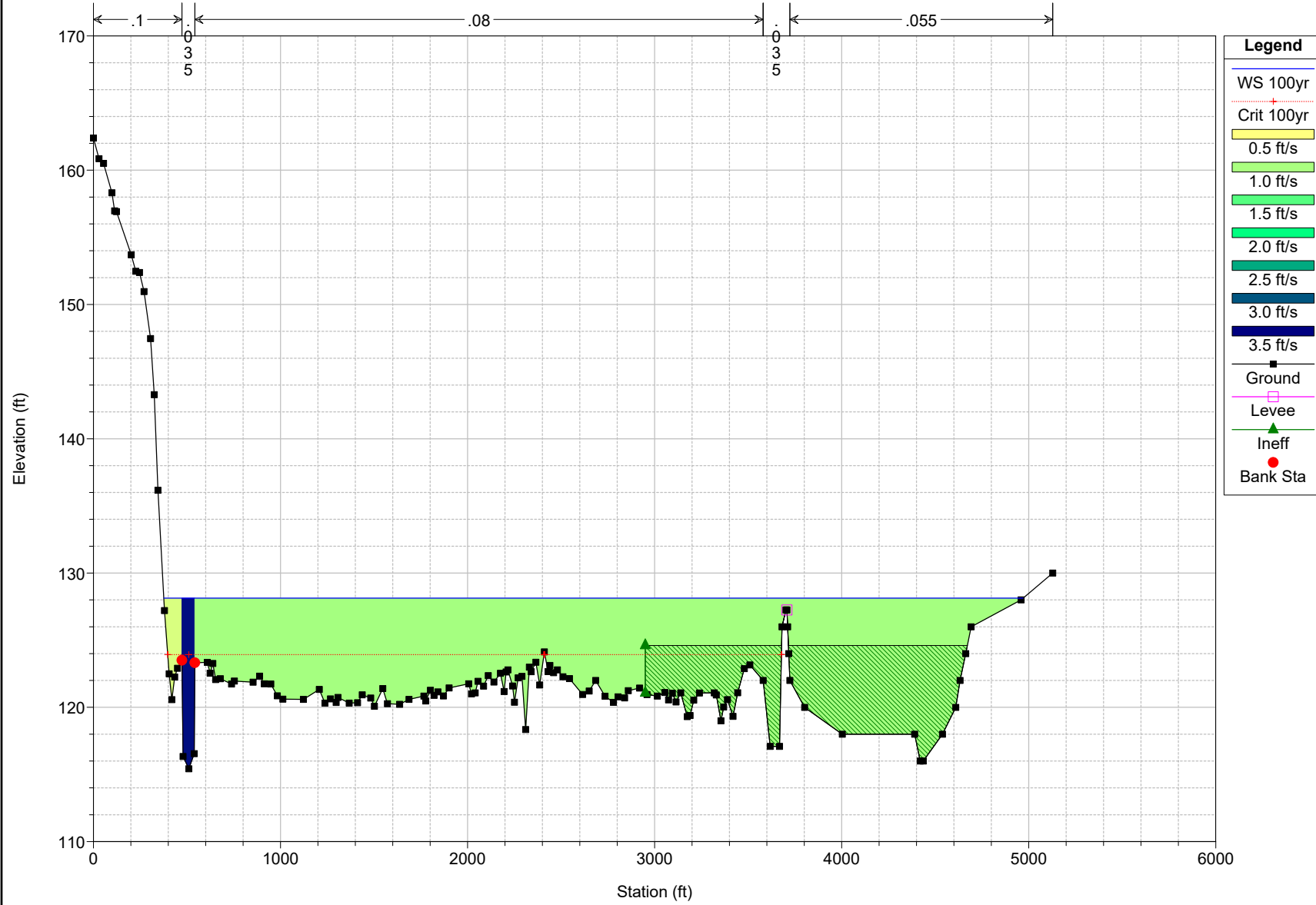
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 197599.6



Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 196568.8

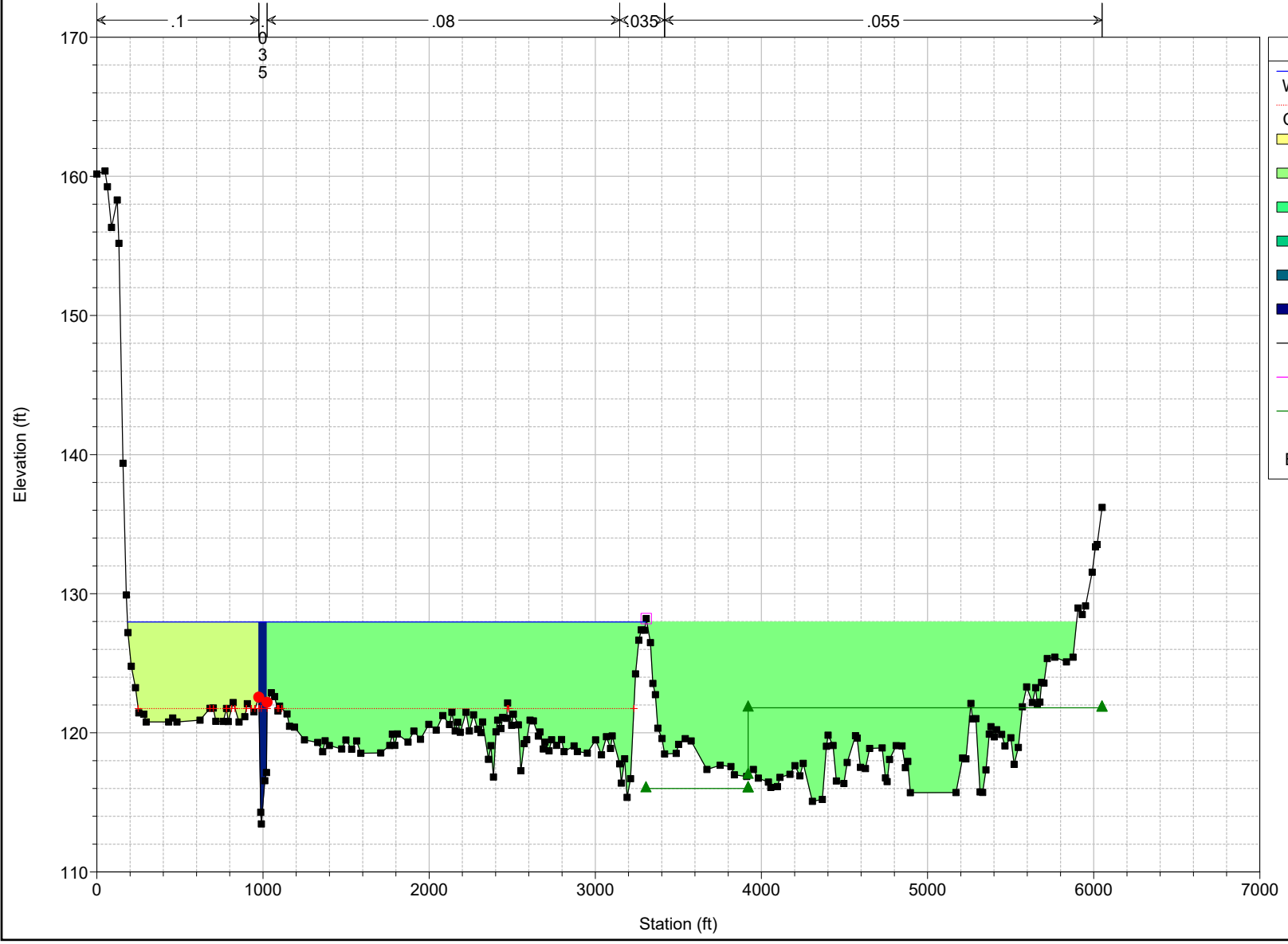


Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 196356.8



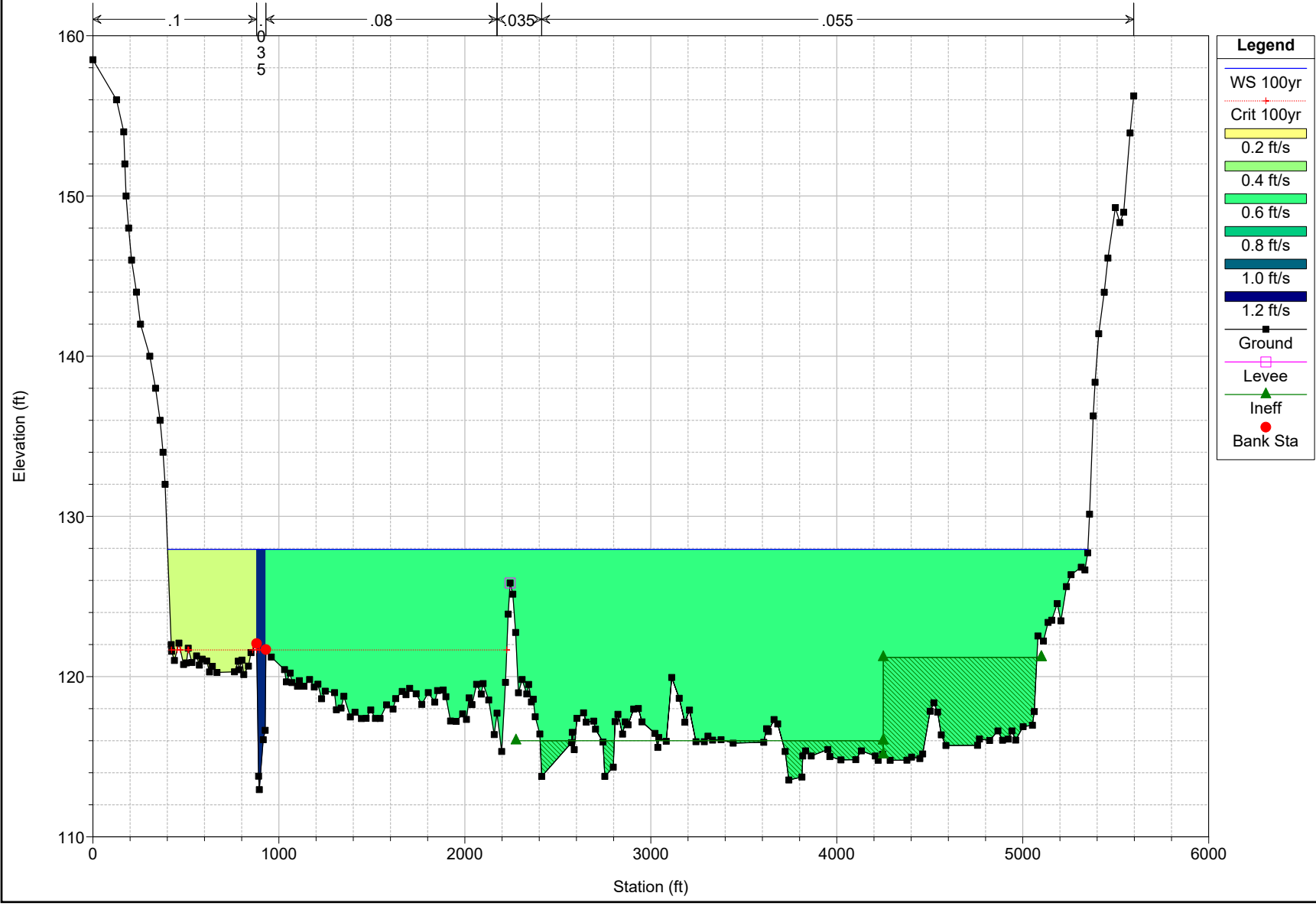
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019

RS = 195583.1



Legend	
WS 100yr	Blue line
Crit 100yr	Red dashed line
0.5 ft/s	Yellow fill
1.0 ft/s	Light green fill
1.5 ft/s	Medium green fill
2.0 ft/s	Dark green fill
2.5 ft/s	Teal fill
3.0 ft/s	Dark blue fill
Ground	Black squares
Levee	Pink square
Ineff	Green triangle
Bank Sta	Red circle

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 194817.8

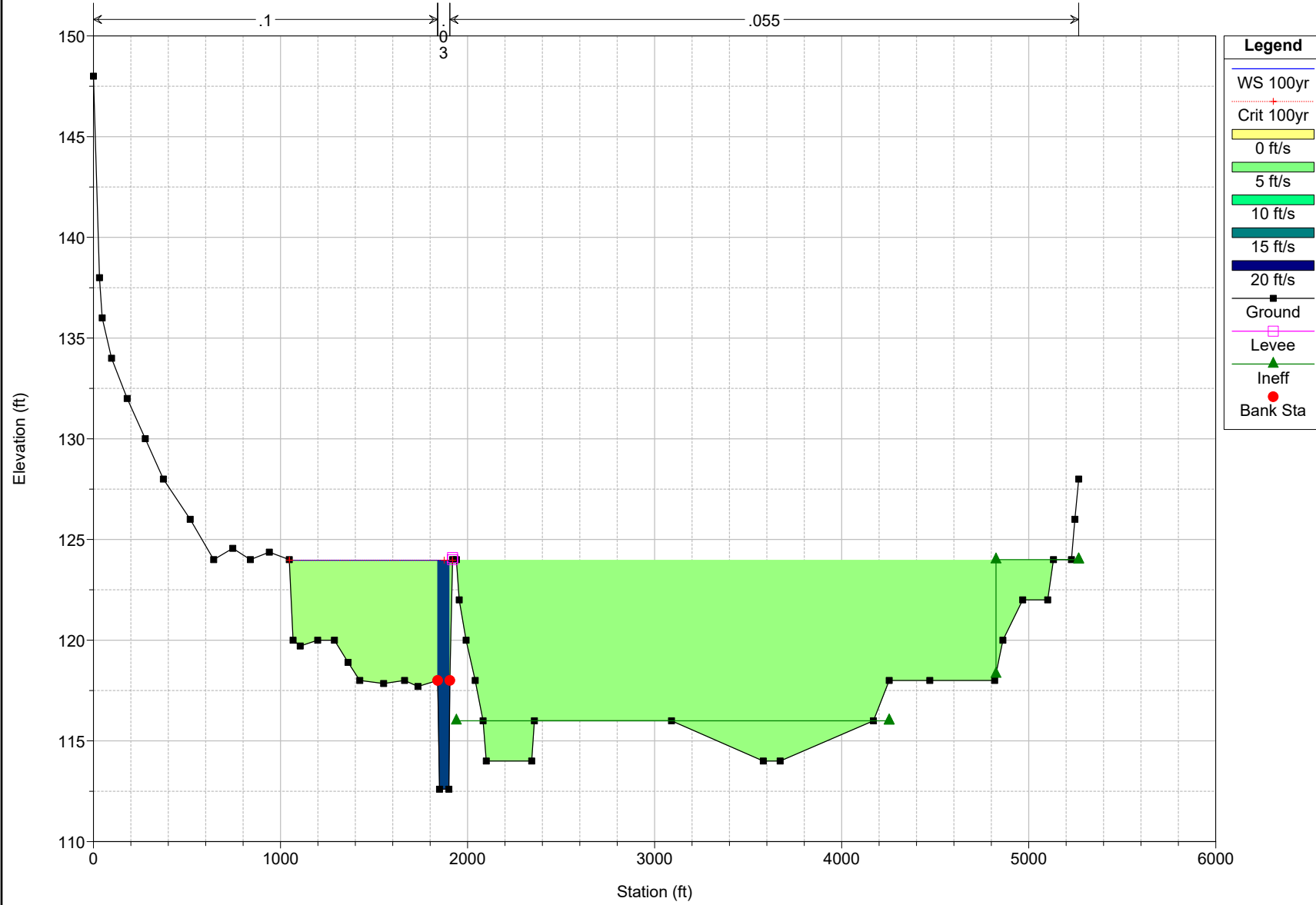


- Legend**
- WS 100yr
  - Crit 100yr
  - 0.2 ft/s
  - 0.4 ft/s
  - 0.6 ft/s
  - 0.8 ft/s
  - 1.0 ft/s
  - 1.2 ft/s
  - Ground
  - Levee
  - Ineff
  - Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193854.4



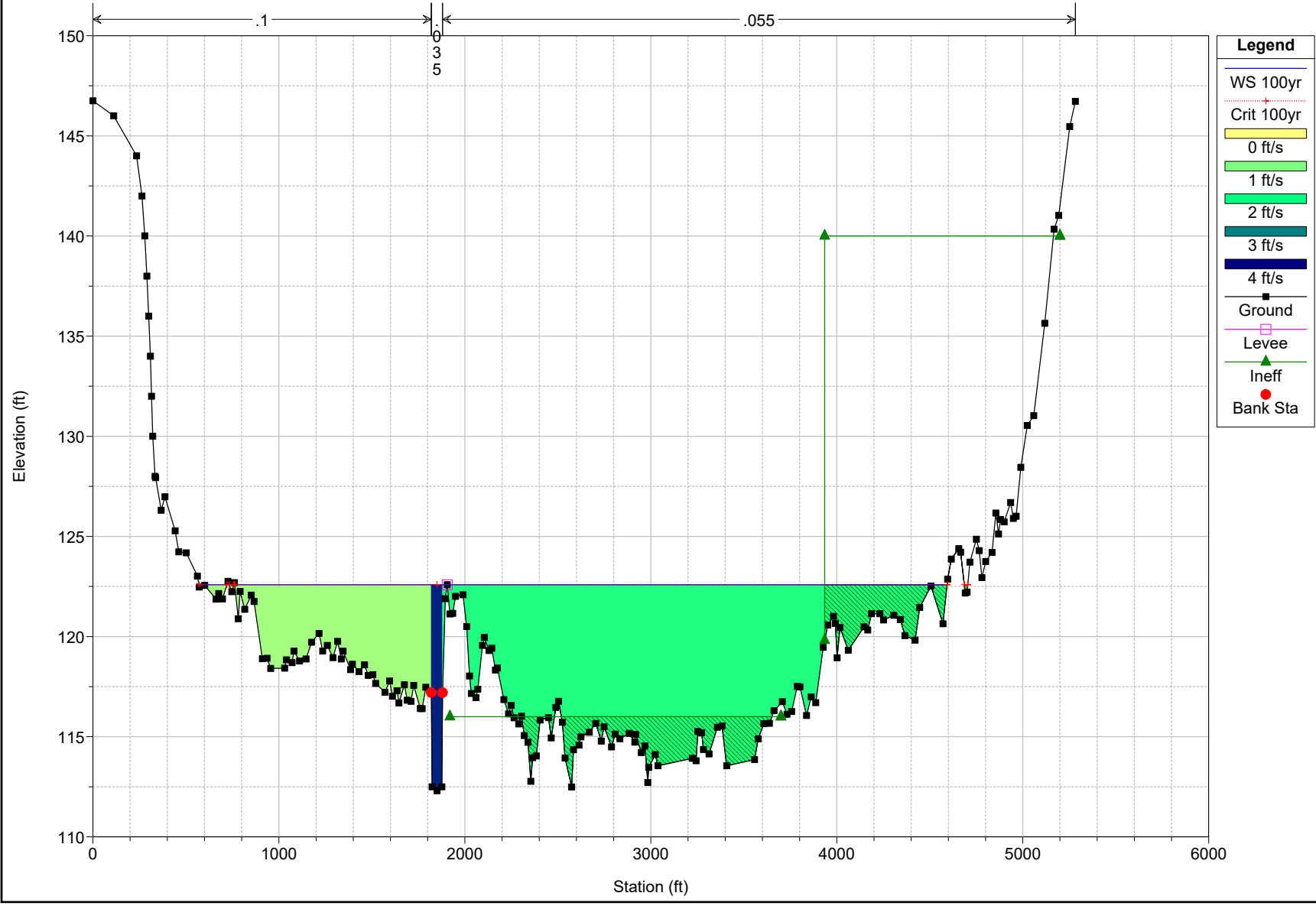
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193357.9



**Legend**

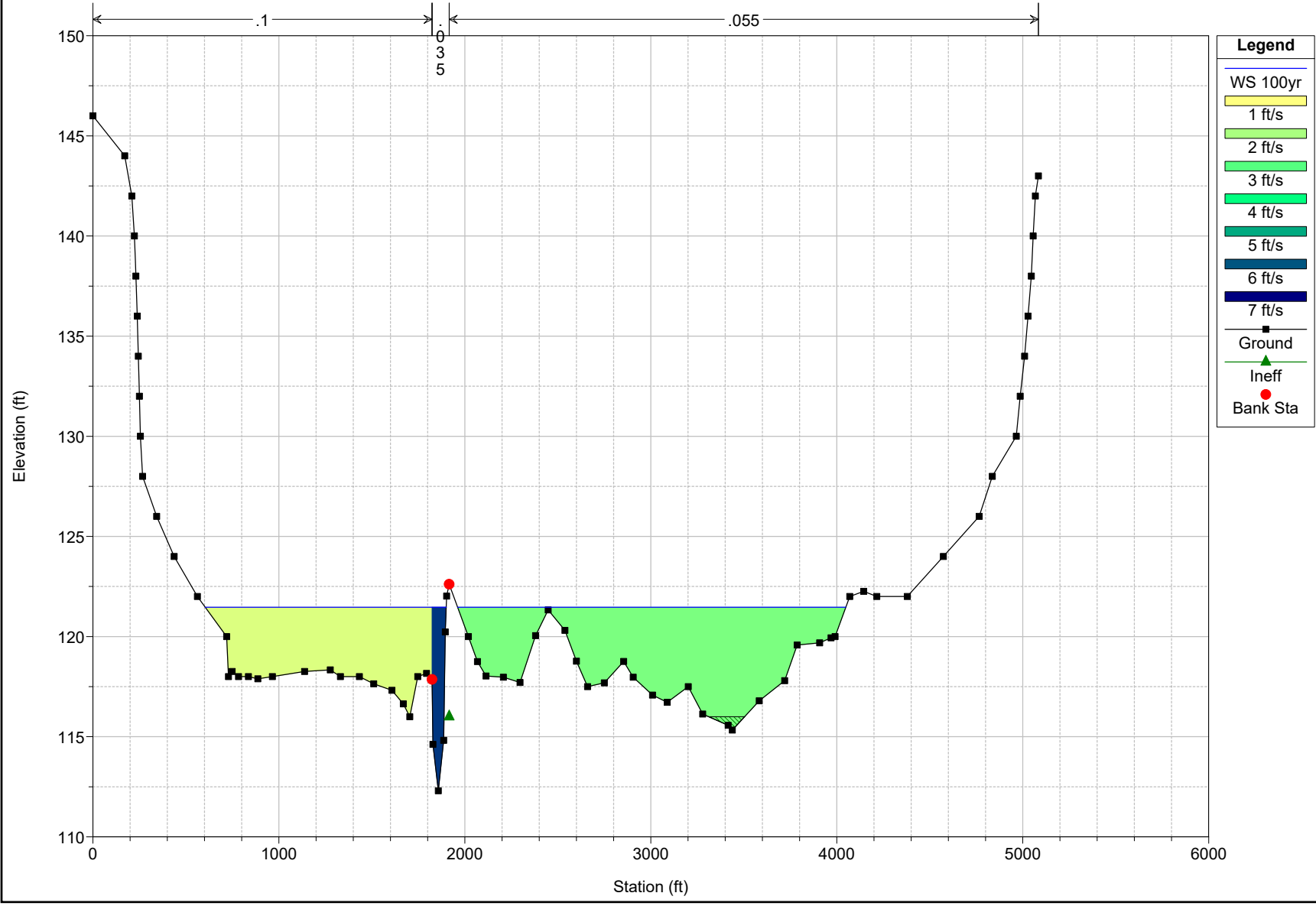
- WS 100yr
- Crit 100yr
- 0 ft/s
- 5 ft/s
- 10 ft/s
- 15 ft/s
- 20 ft/s
- Ground
- Levee
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 193176.6





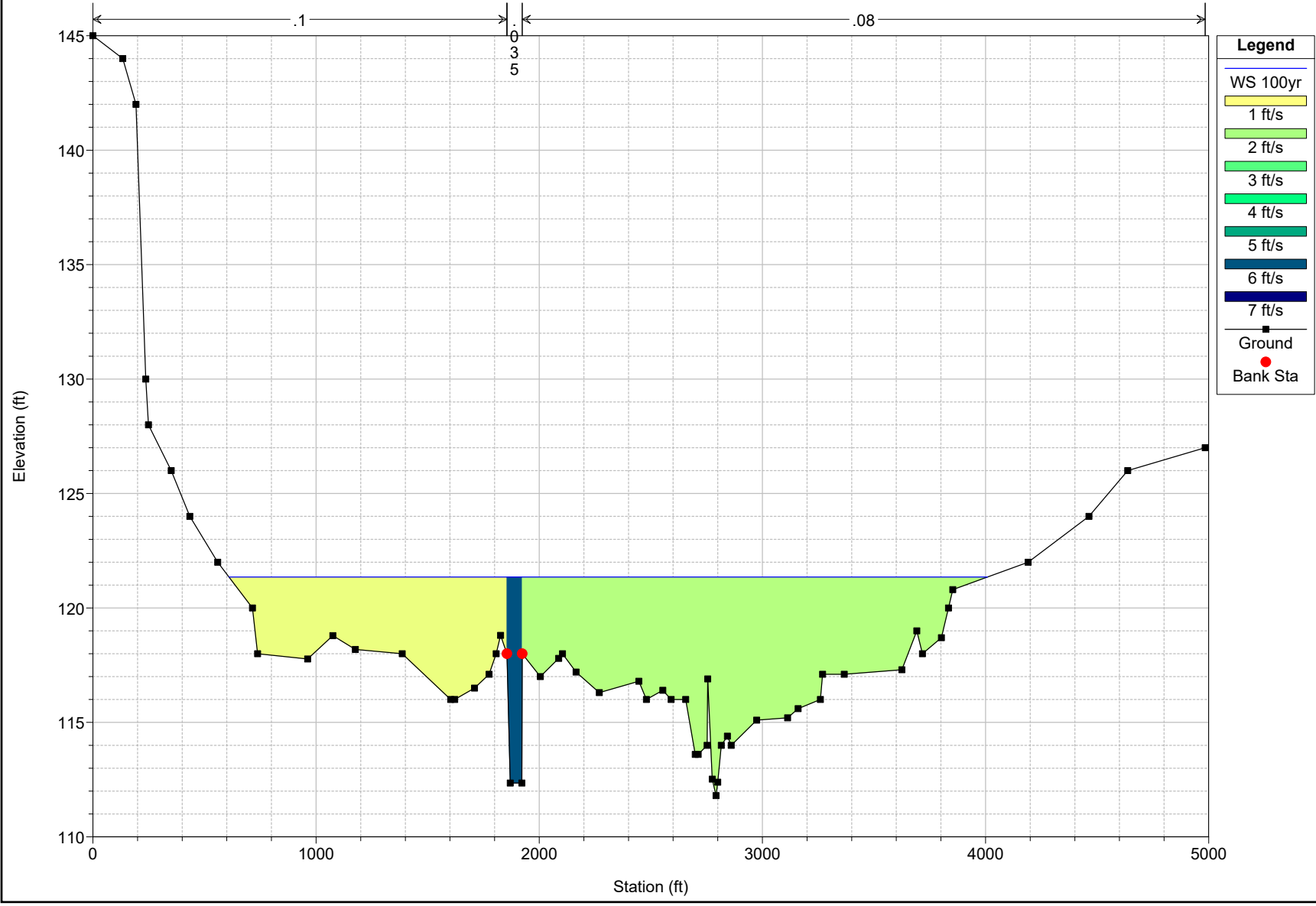
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 192867



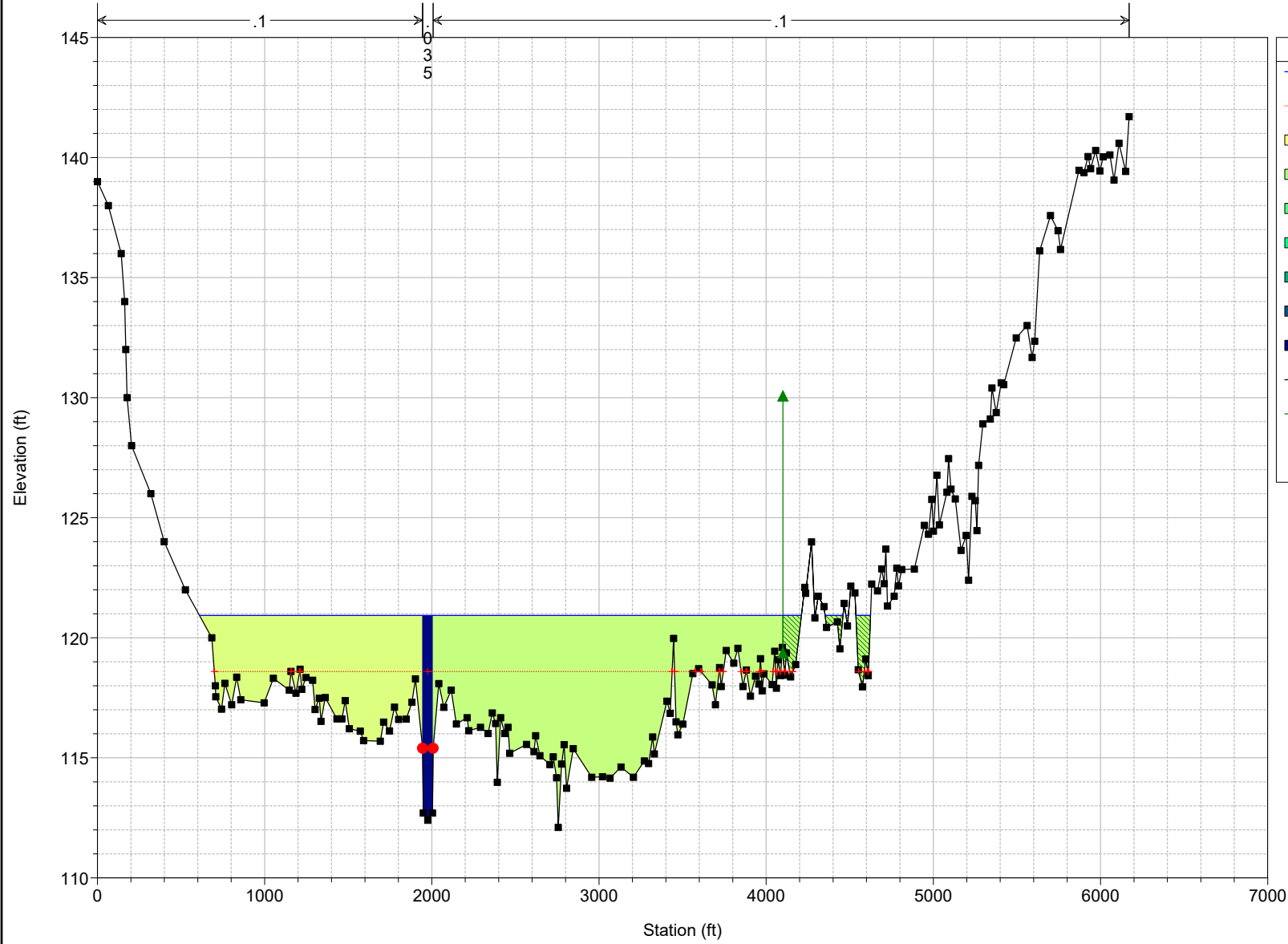
**Legend**

- WS 100yr
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 192774.7



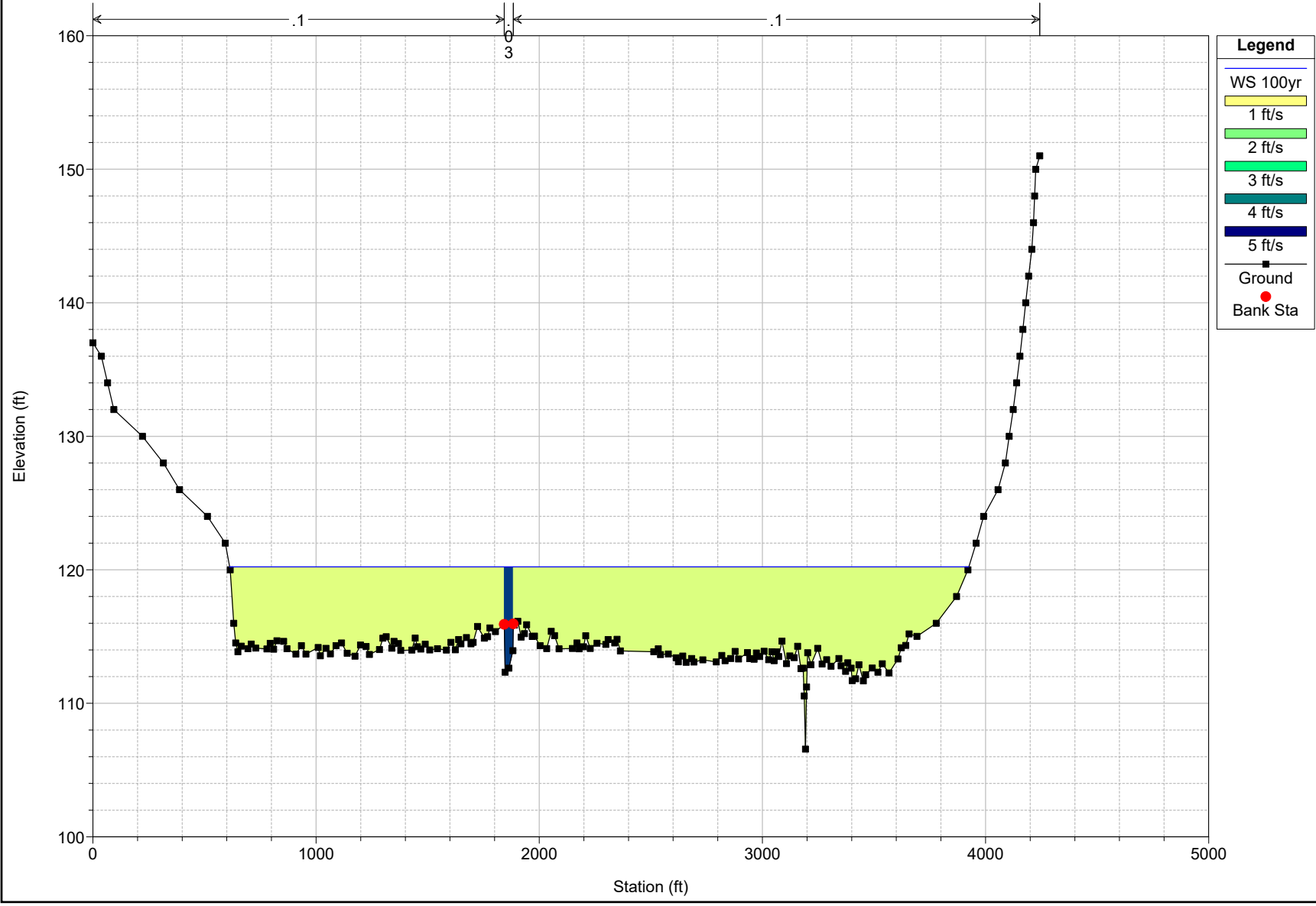
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 192514.9



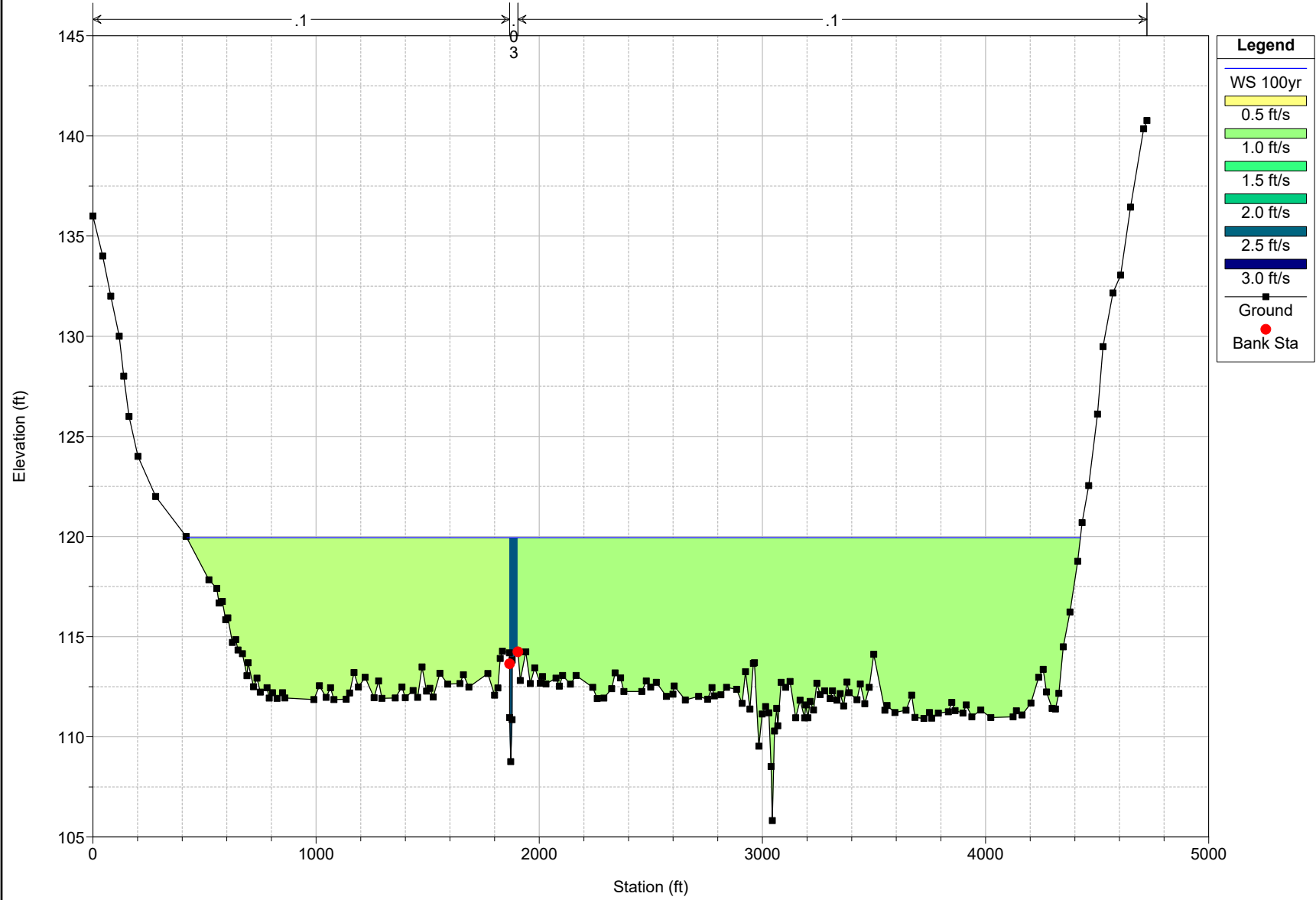
**Legend**

- WS 100yr
- Crit 100yr
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- 6 ft/s
- 7 ft/s
- Ground
- Ineff
- Bank Sta

Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
RS = 191681.5



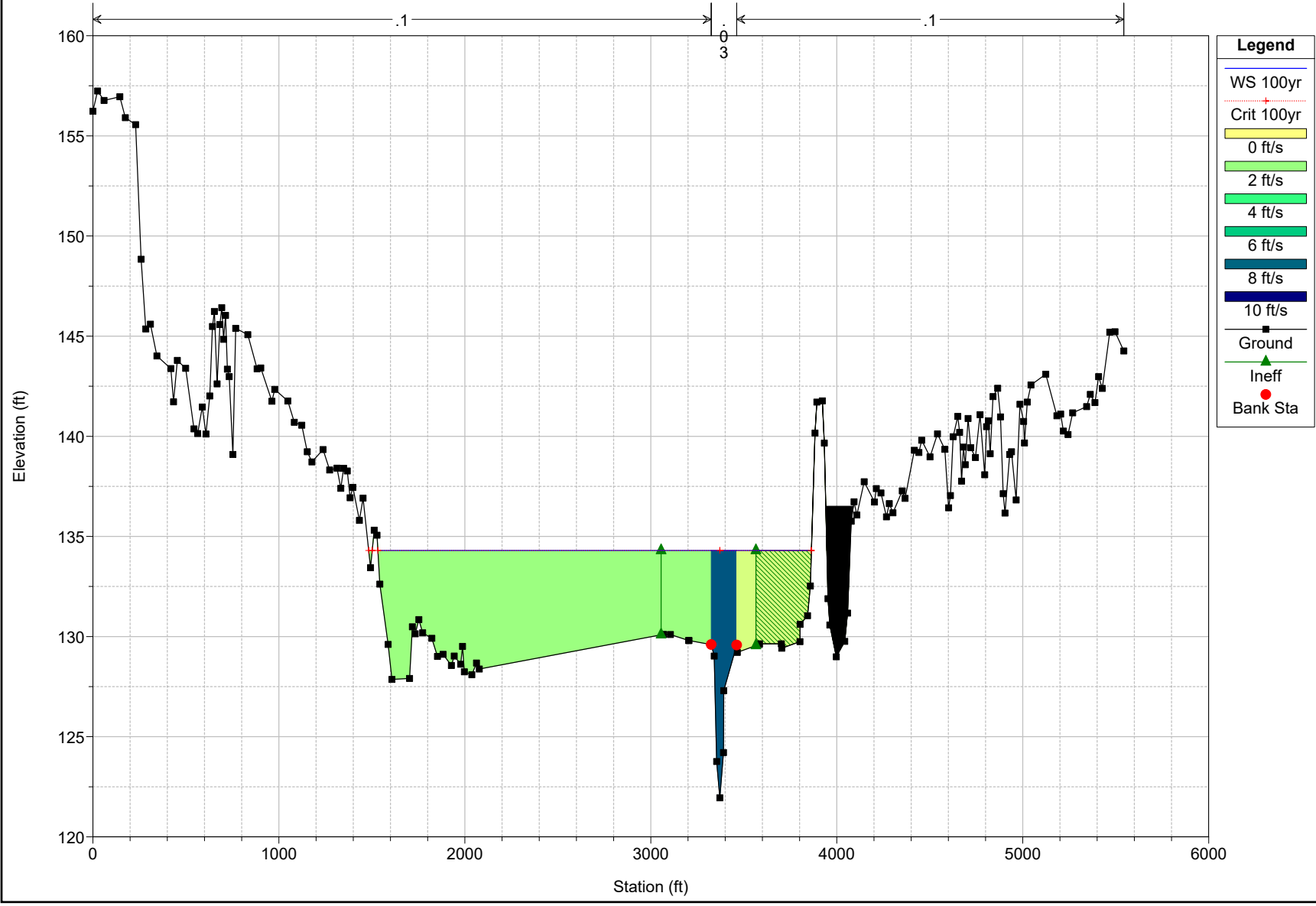
Patuxent River Plan: Patuxent River - Multiple Run 6/6/2019  
 RS = 190879.0



## **Appendix D**

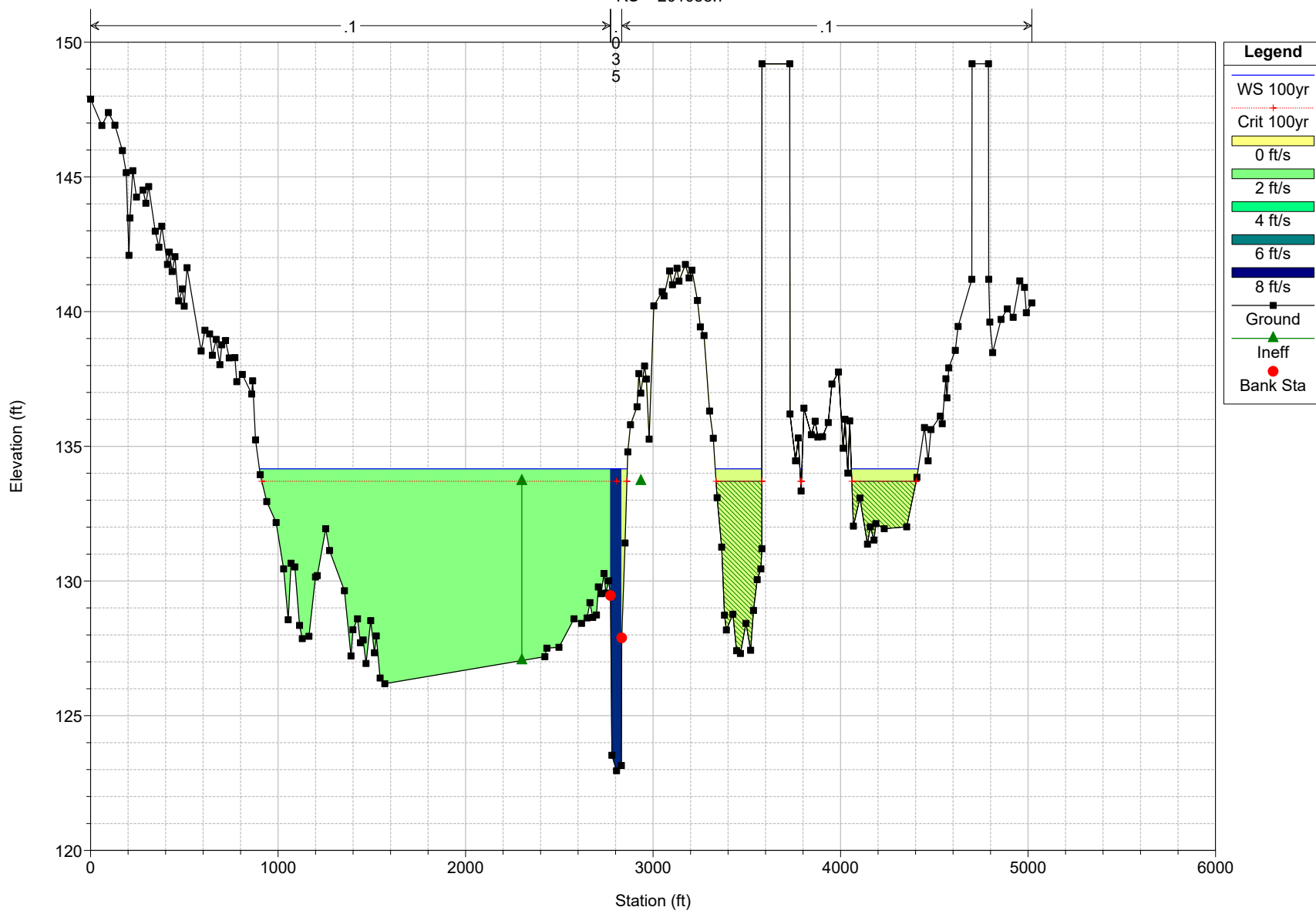
# **Proposed 100-yr Storm Cross Sections with Velocity**

Patuxent River Plan: Plan 04 6/5/2019  
RS = 201119



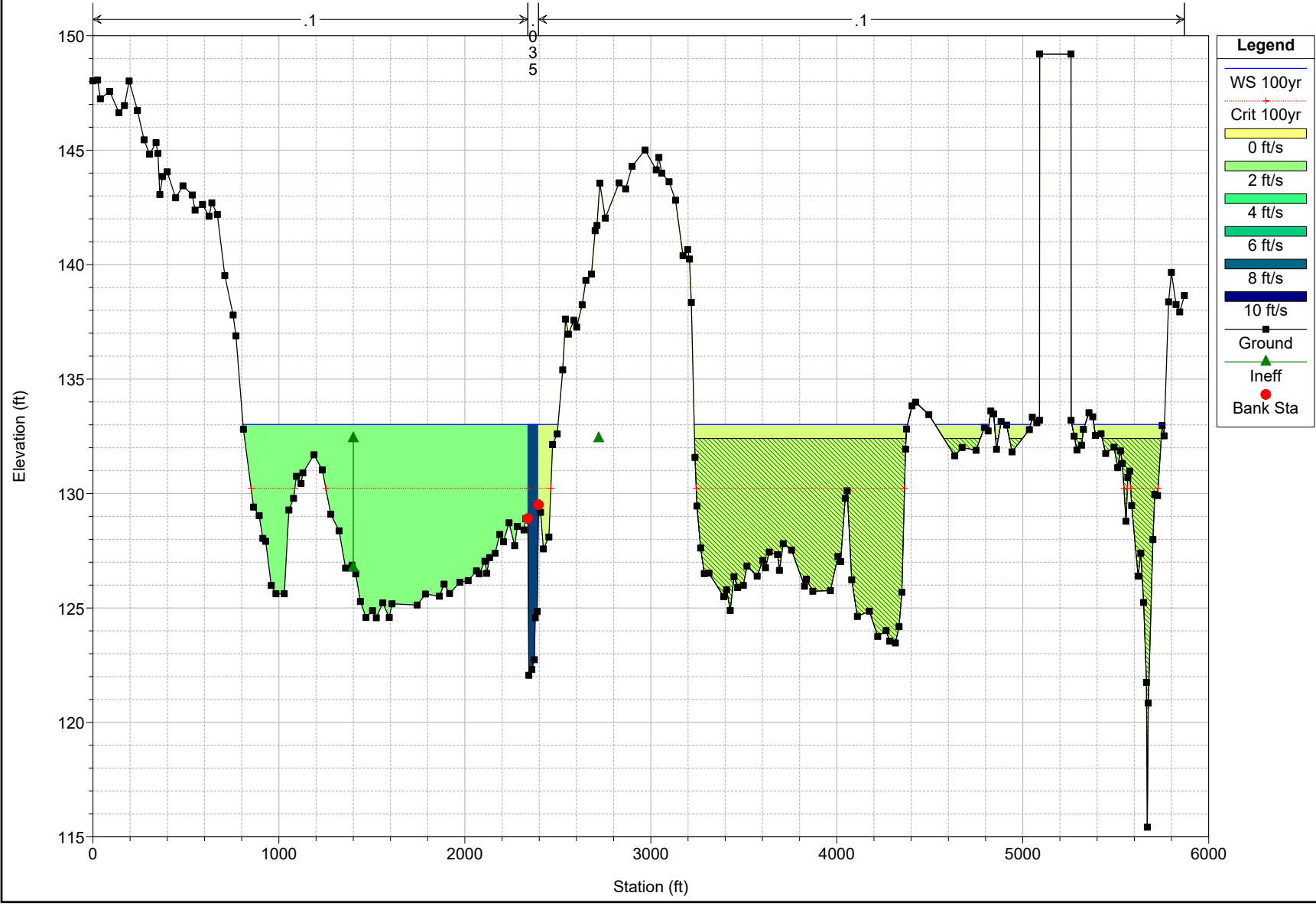
Patuxent River Plan: Plan 04 6/5/2019

RS = 201058.7

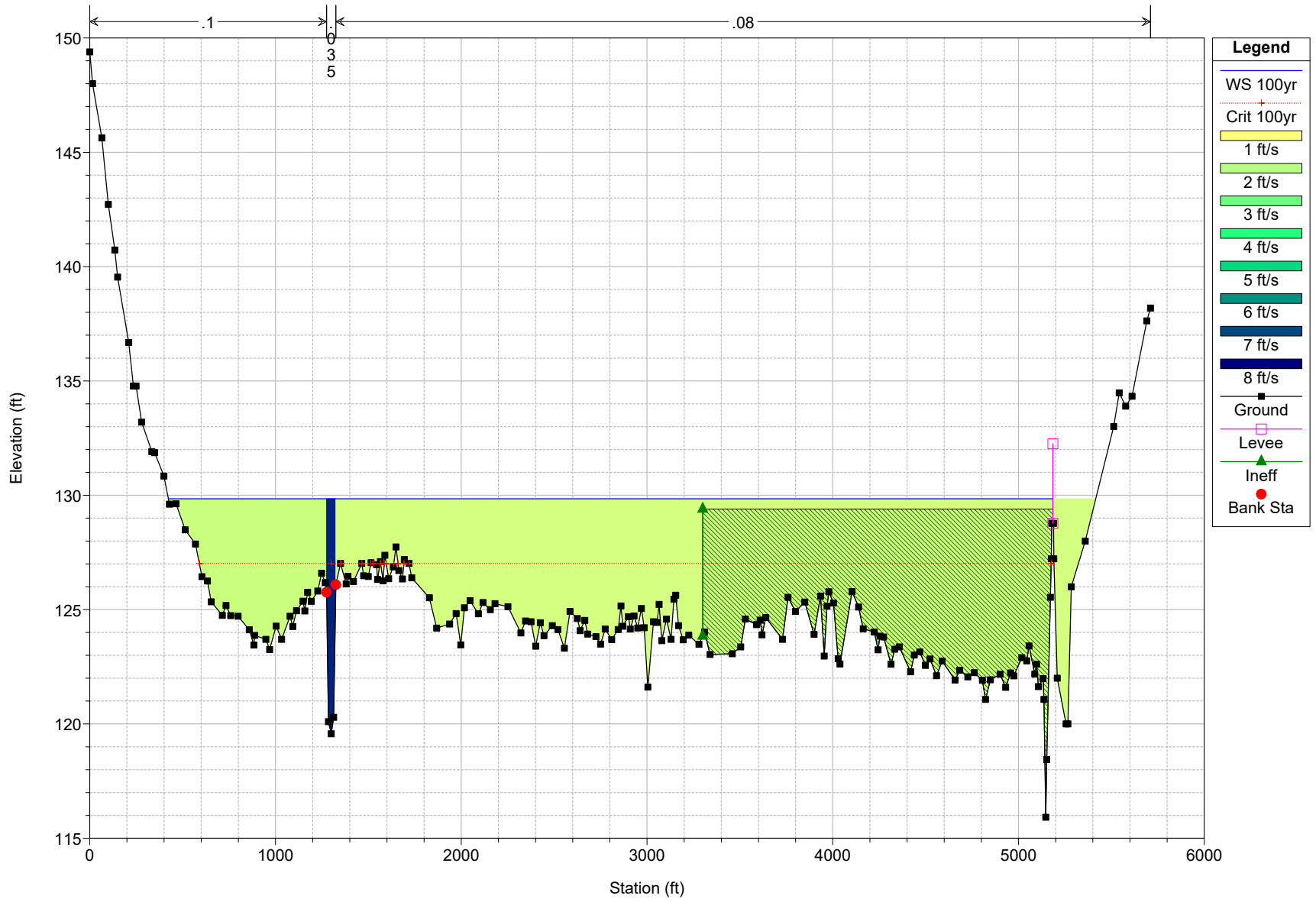




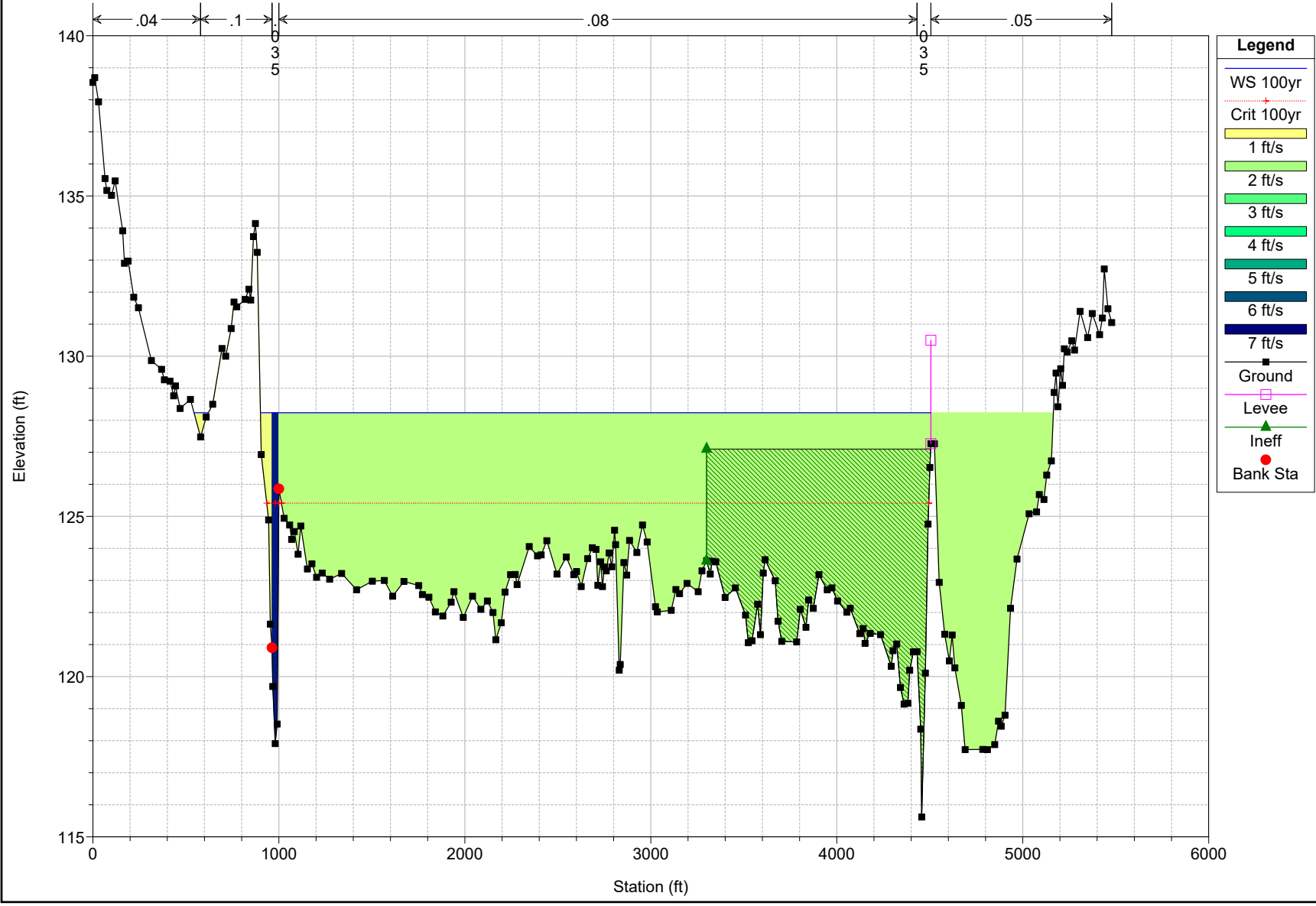
Patuxent River Plan: Plan 04 6/5/2019  
RS = 200115.4



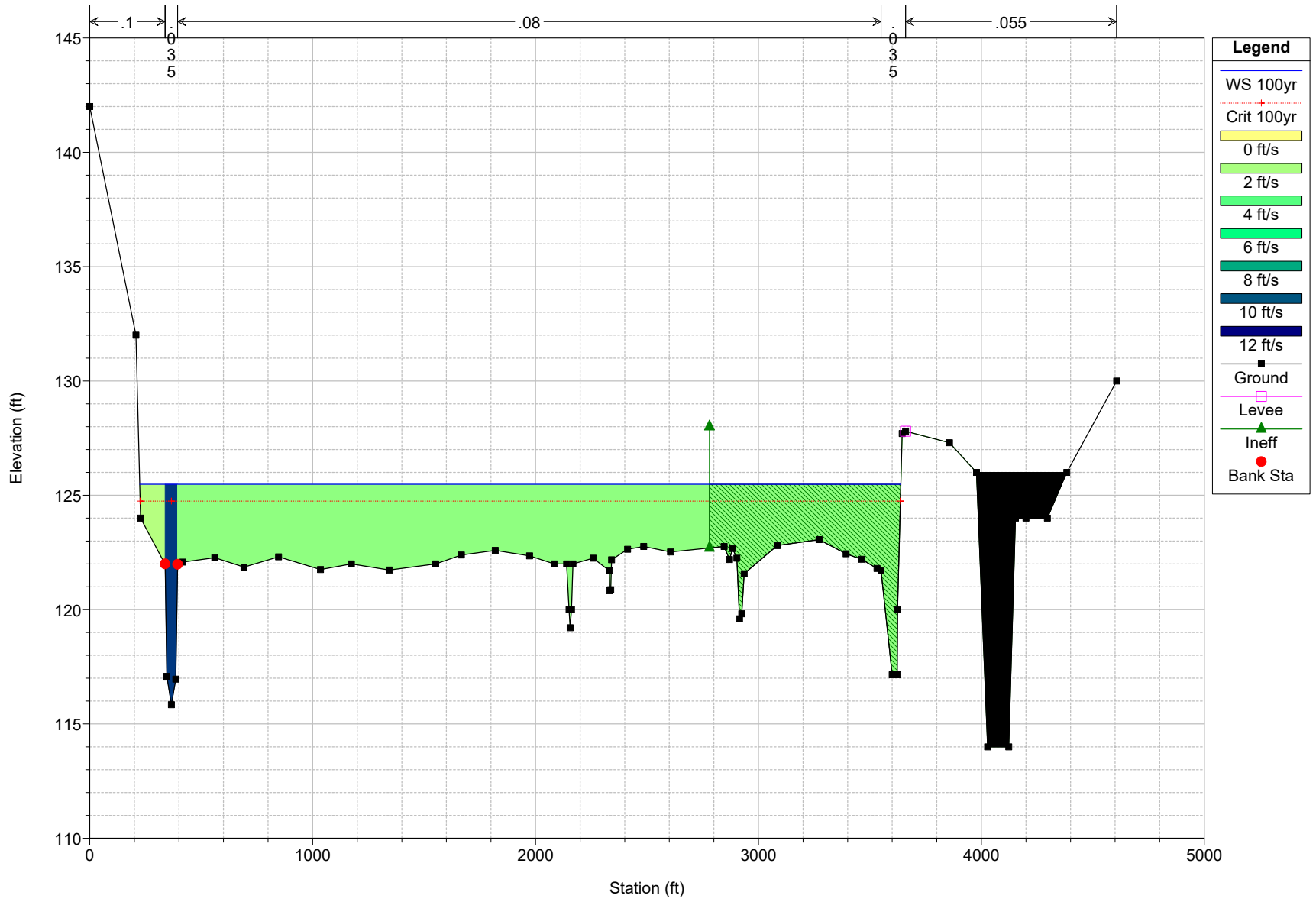
Patuxent River Plan: Plan 04 6/5/2019  
RS = 198588.0



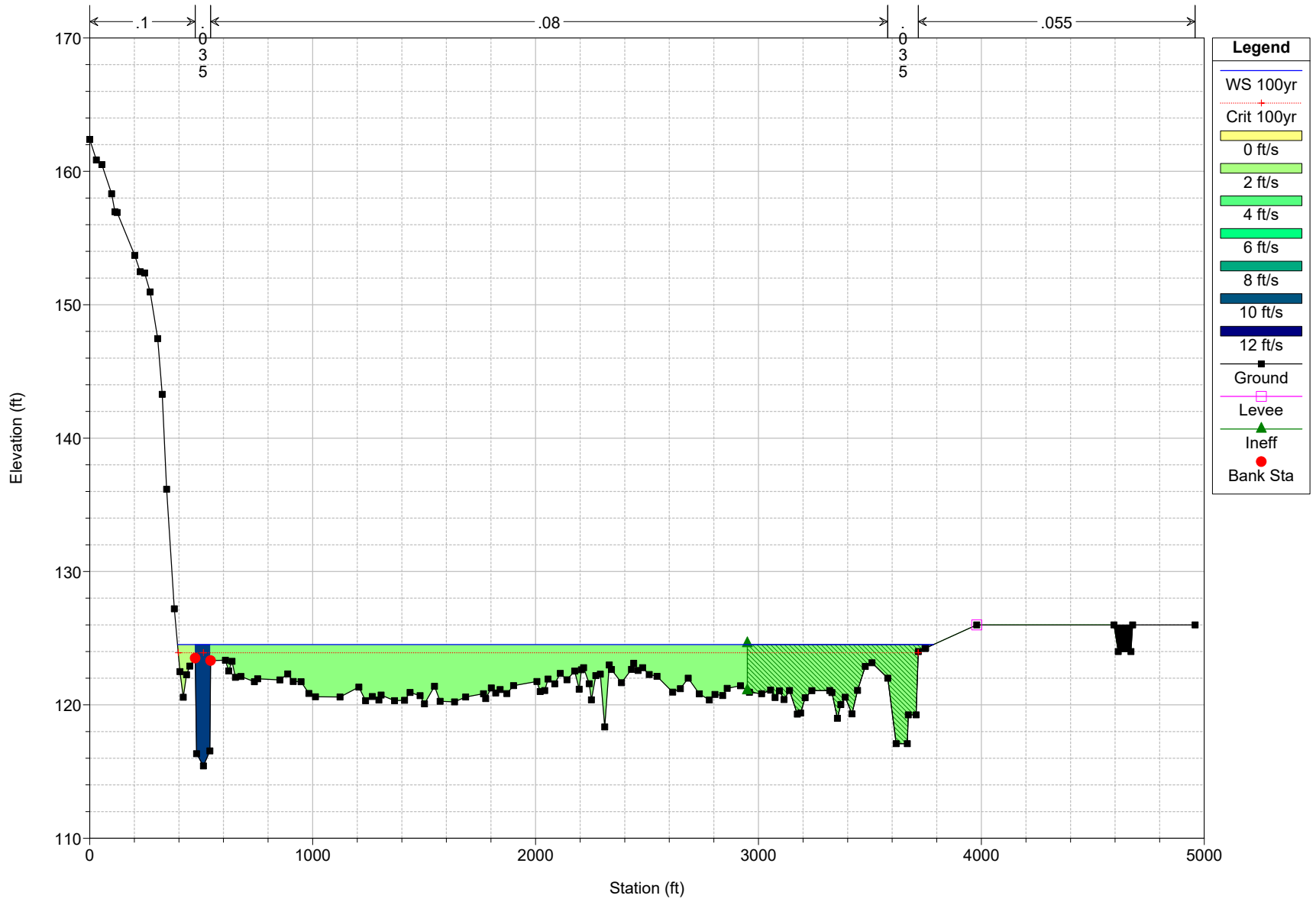
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 197599.6



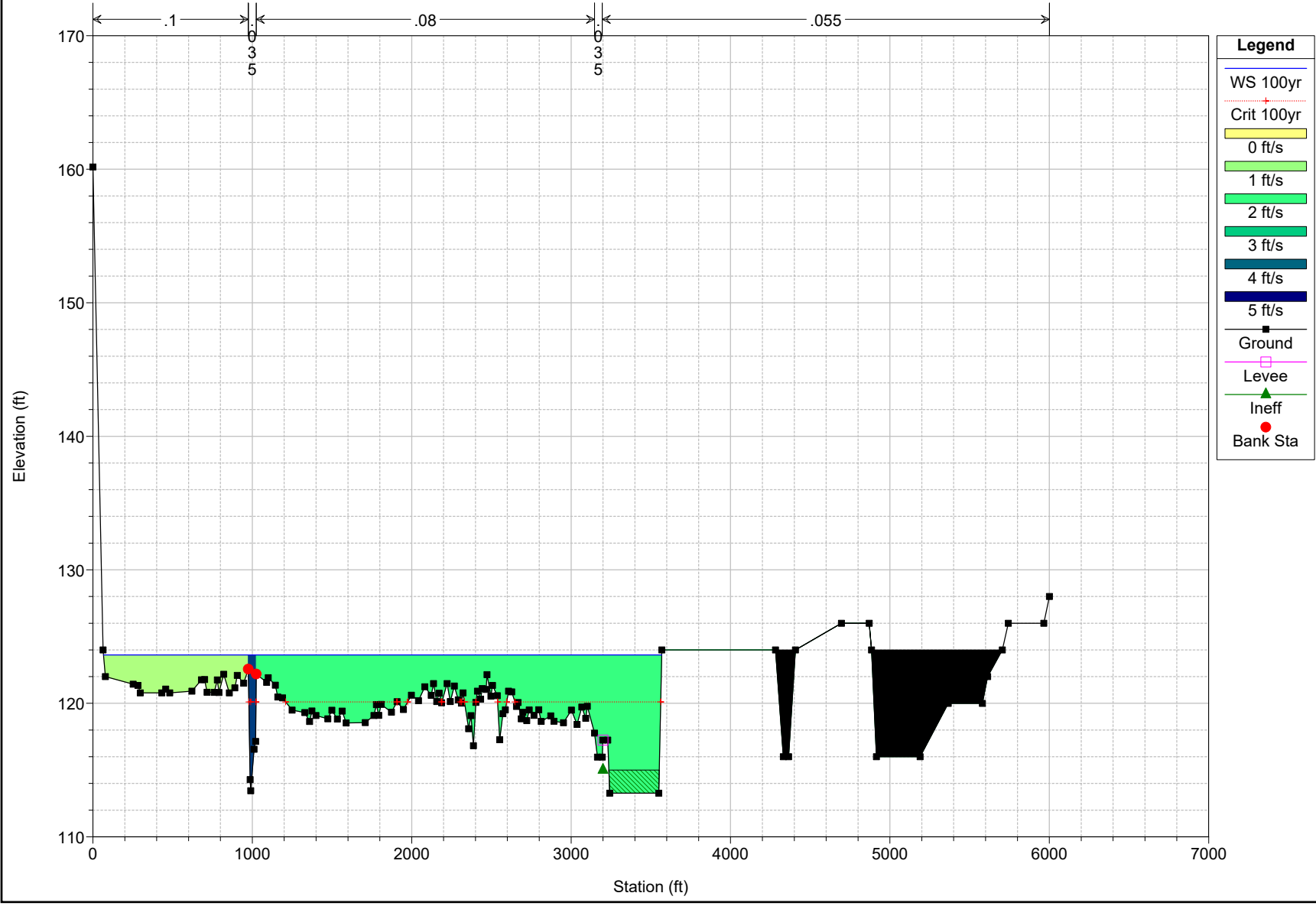
Patuxent River Plan: Plan 04 6/5/2019  
RS = 196568.8



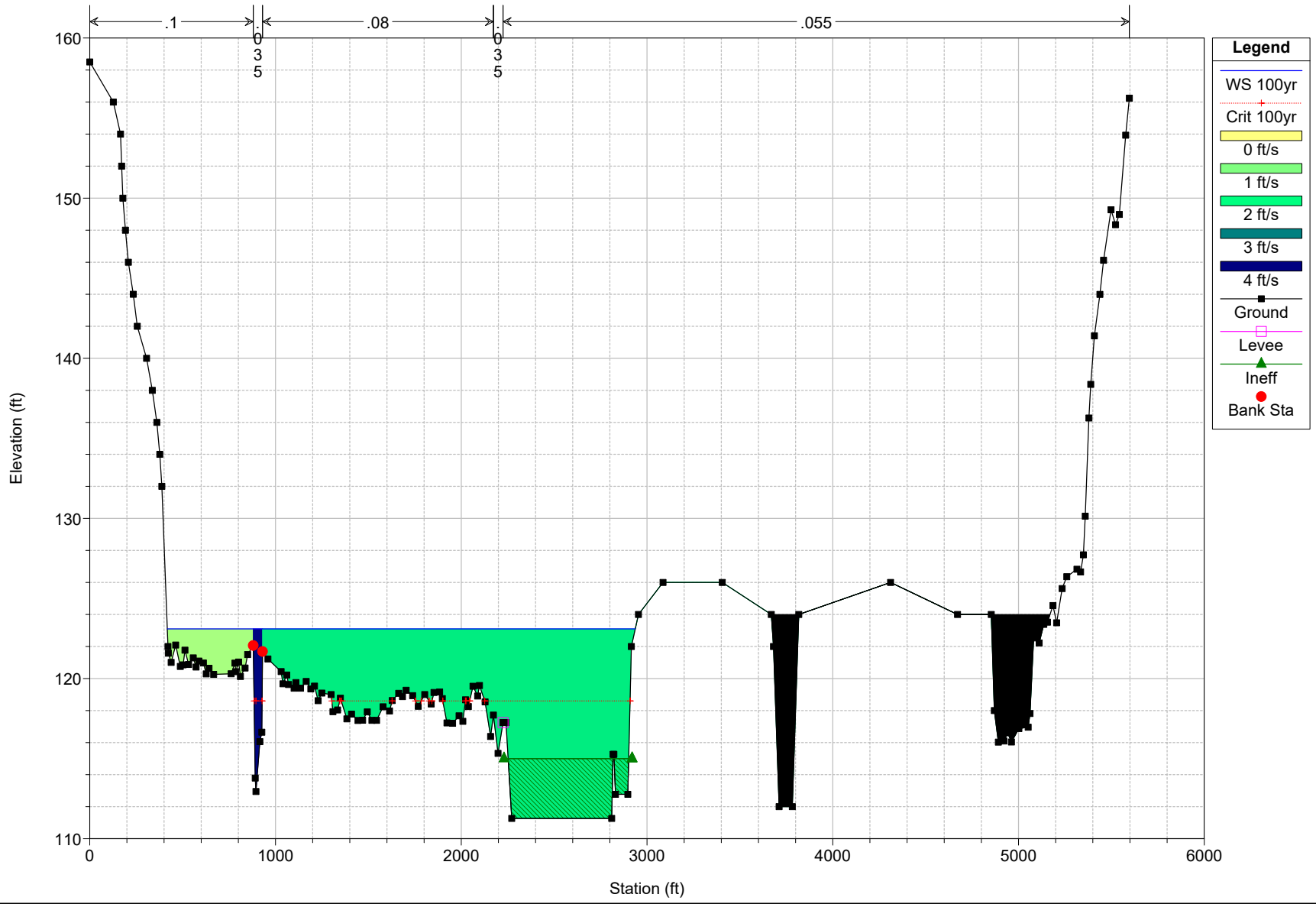
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 196356.8



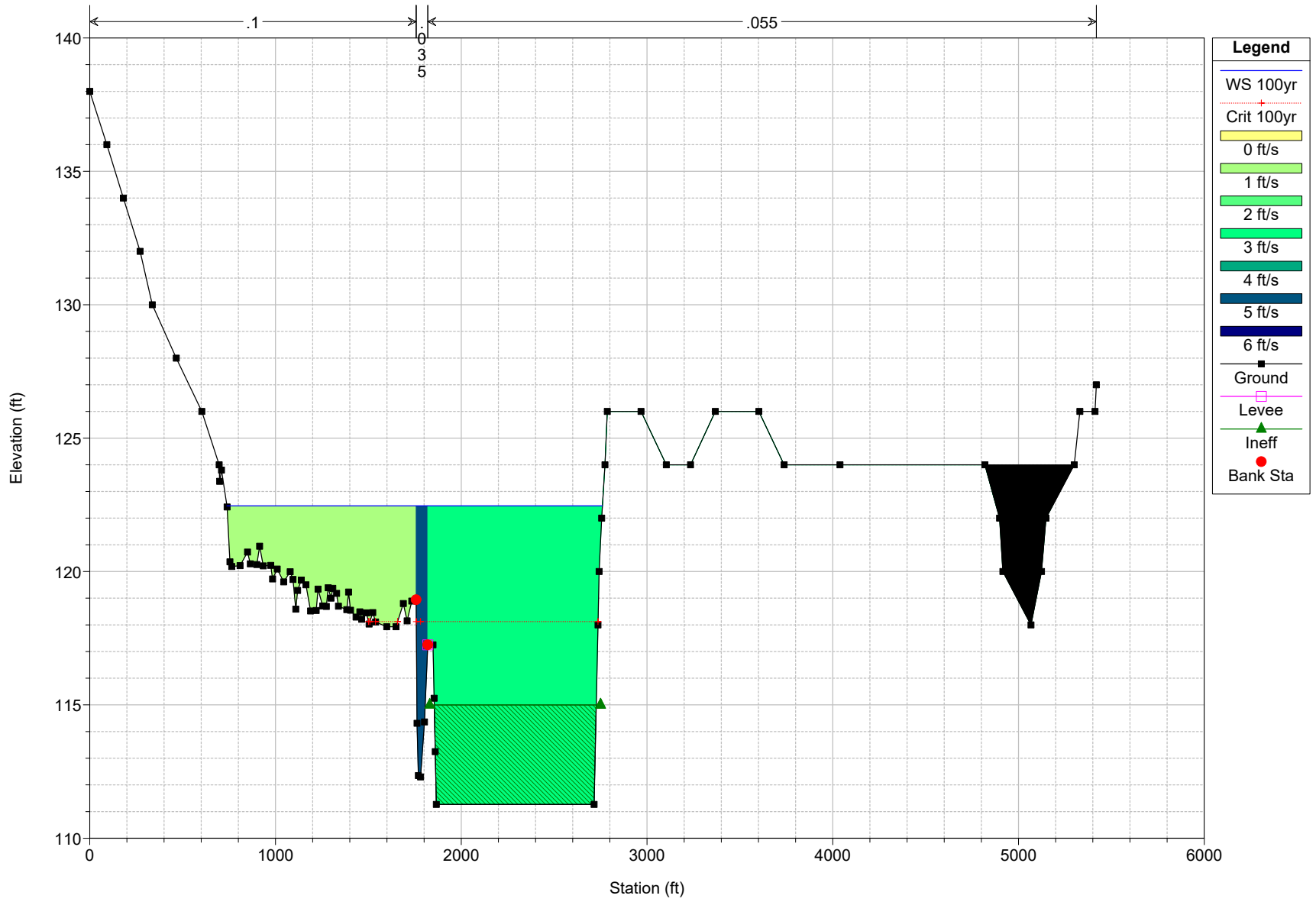
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 195583.1



Patuxent River Plan: Plan 04 6/5/2019  
 RS = 194817.8

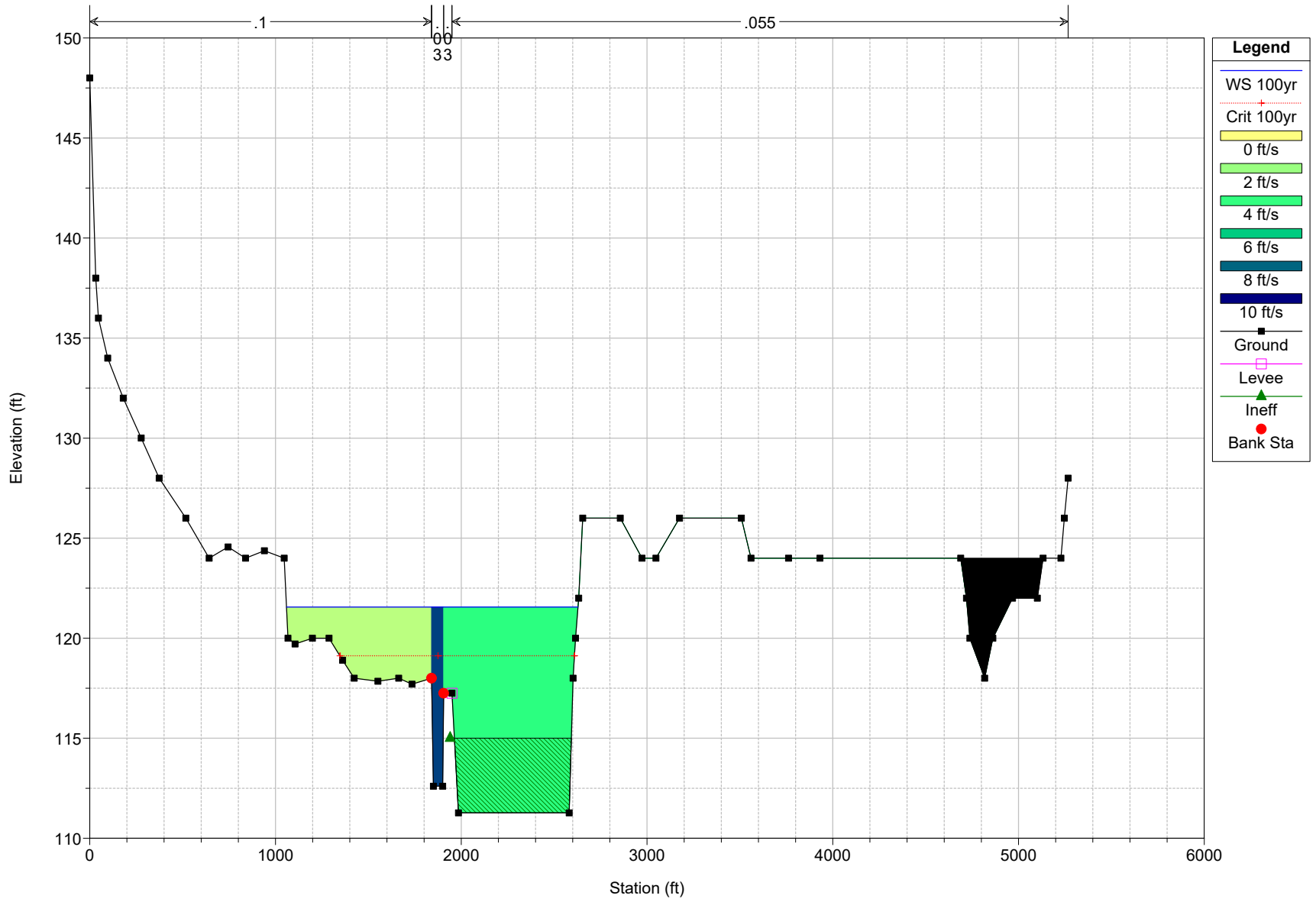


Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193854.4

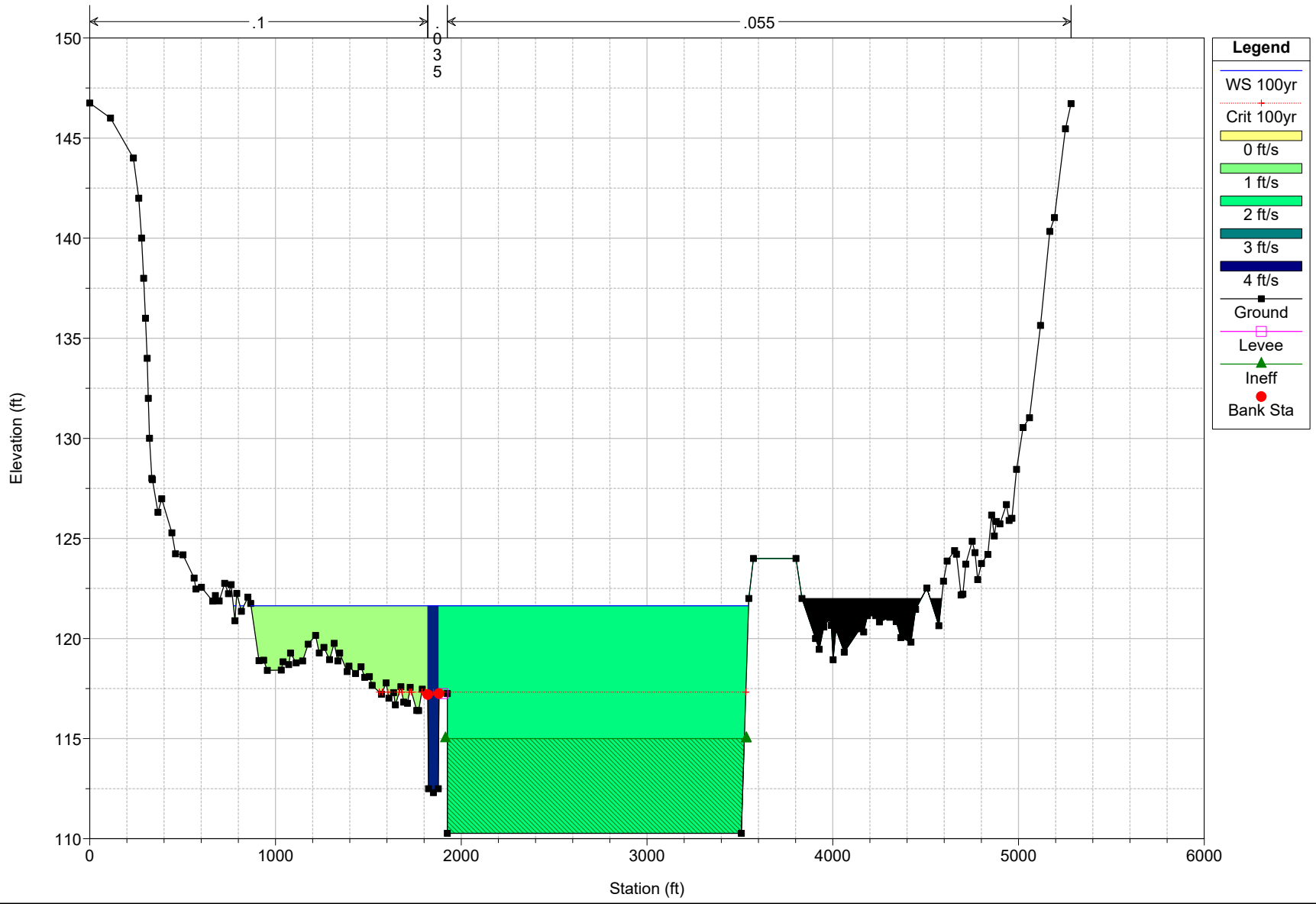




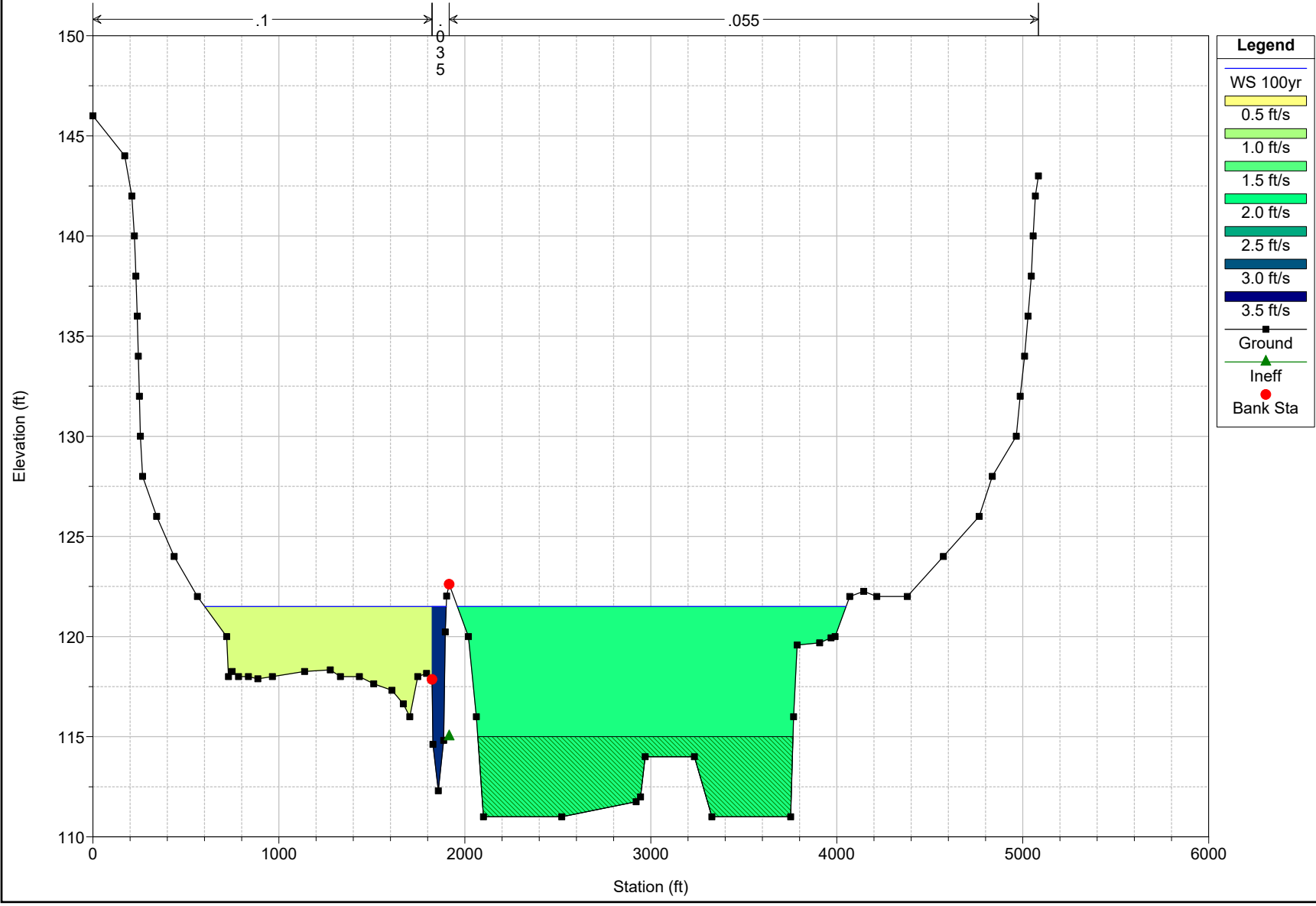
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193357.9



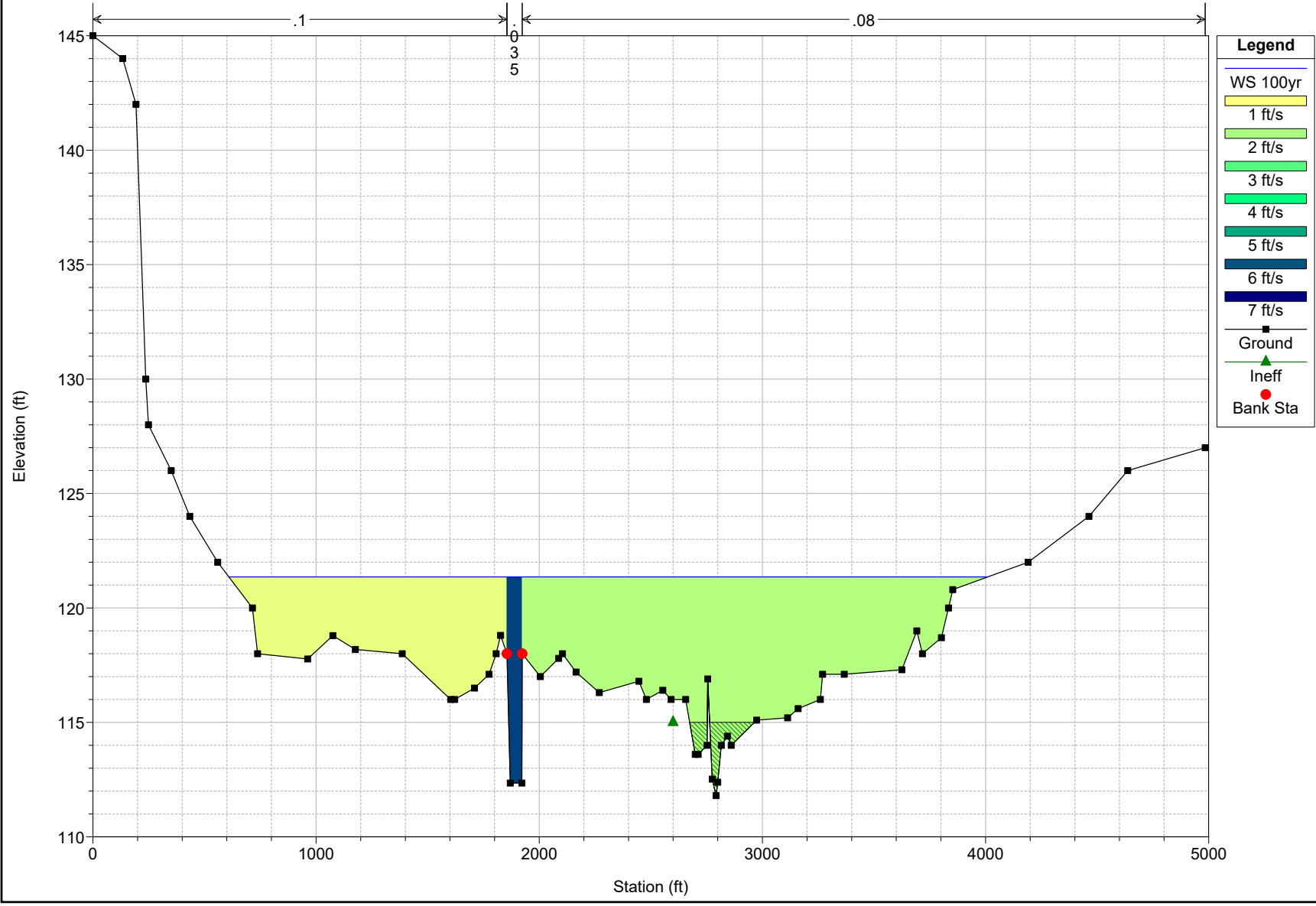
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193176.6



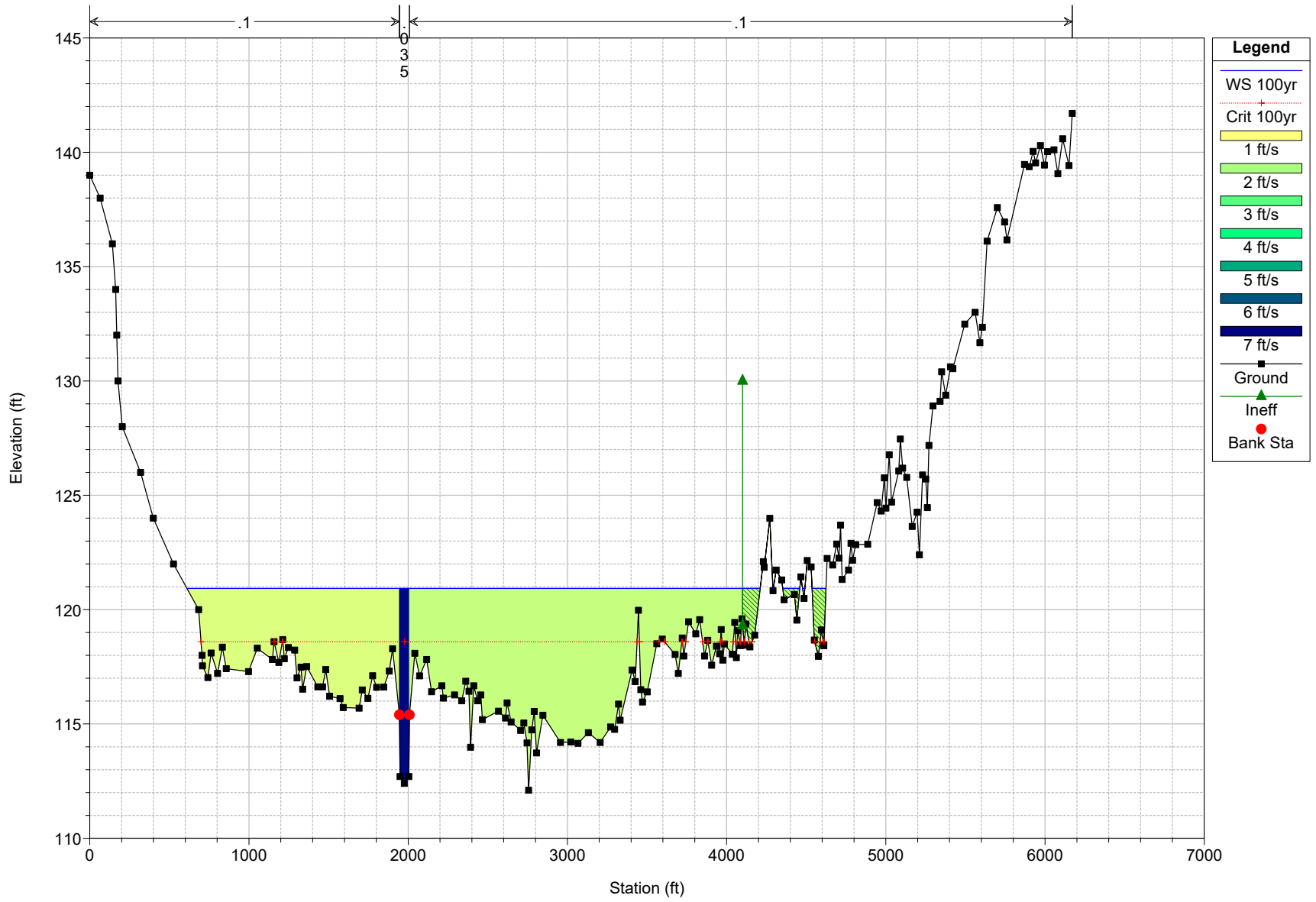
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 192867



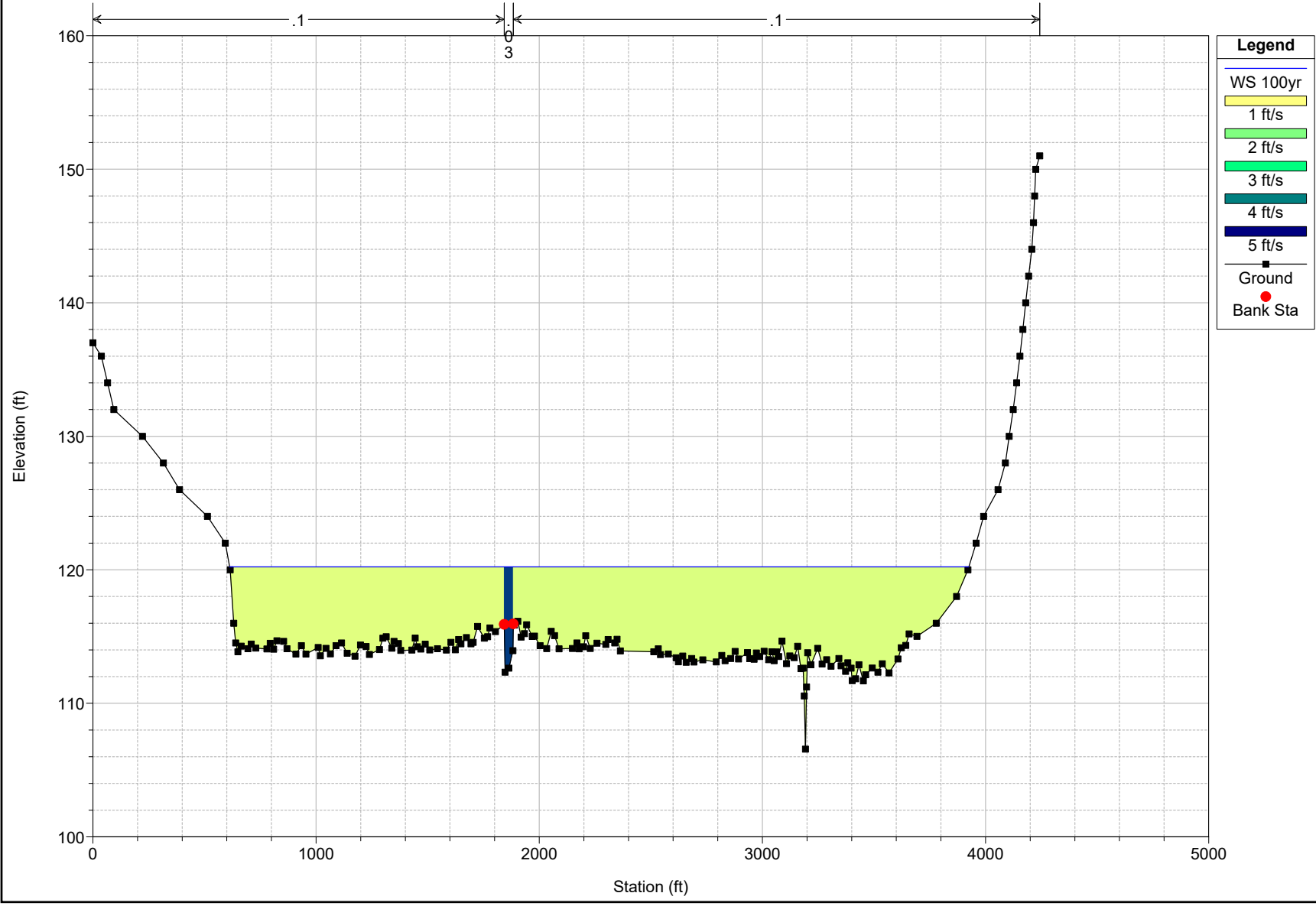
Patuxent River Plan: Plan 04 6/5/2019  
RS = 192774.7



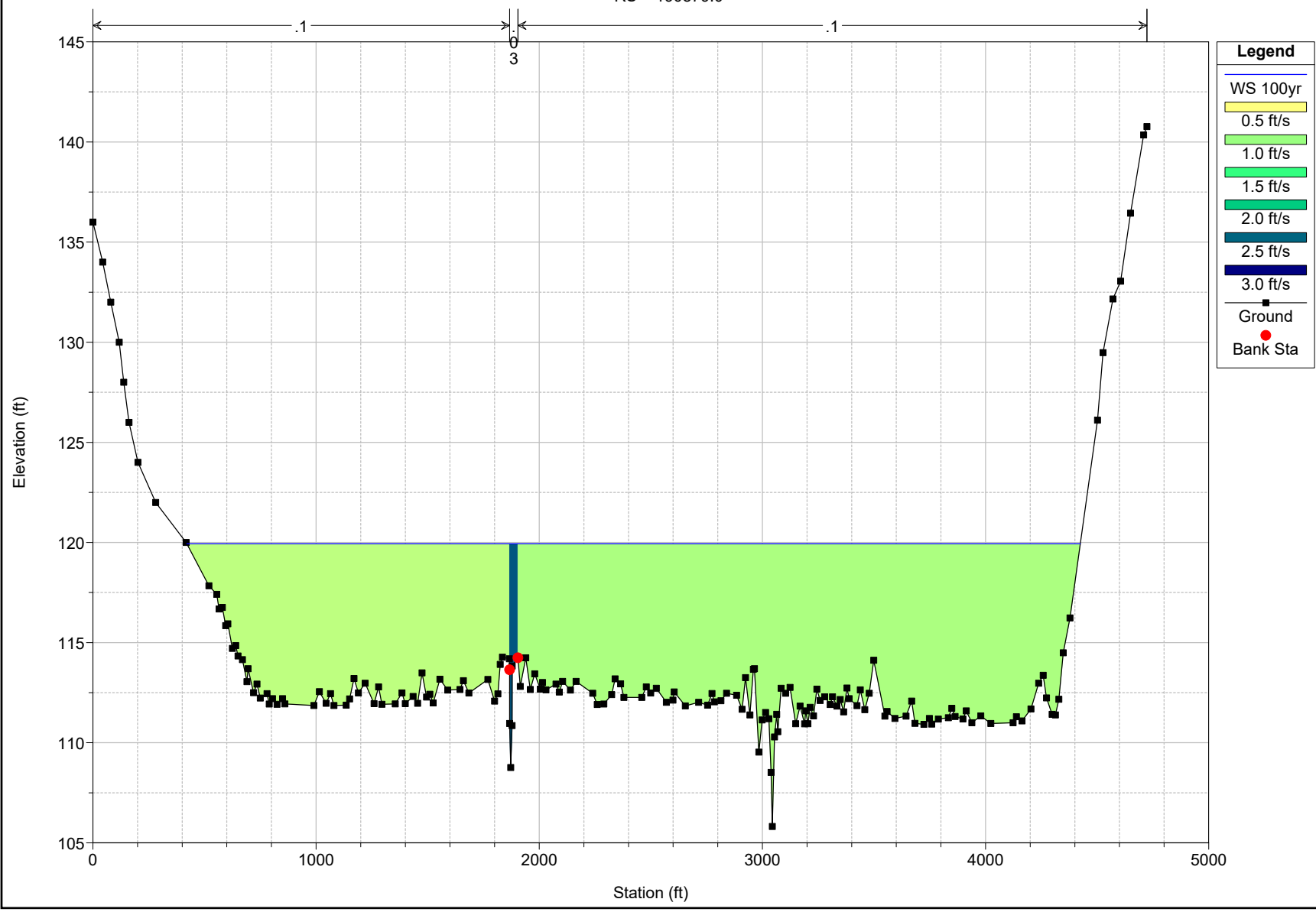
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 192514.9



Patuxent River Plan: Plan 04 6/5/2019  
RS = 191681.5



Patuxent River Plan: Plan 04 6/5/2019  
RS = 190879.0



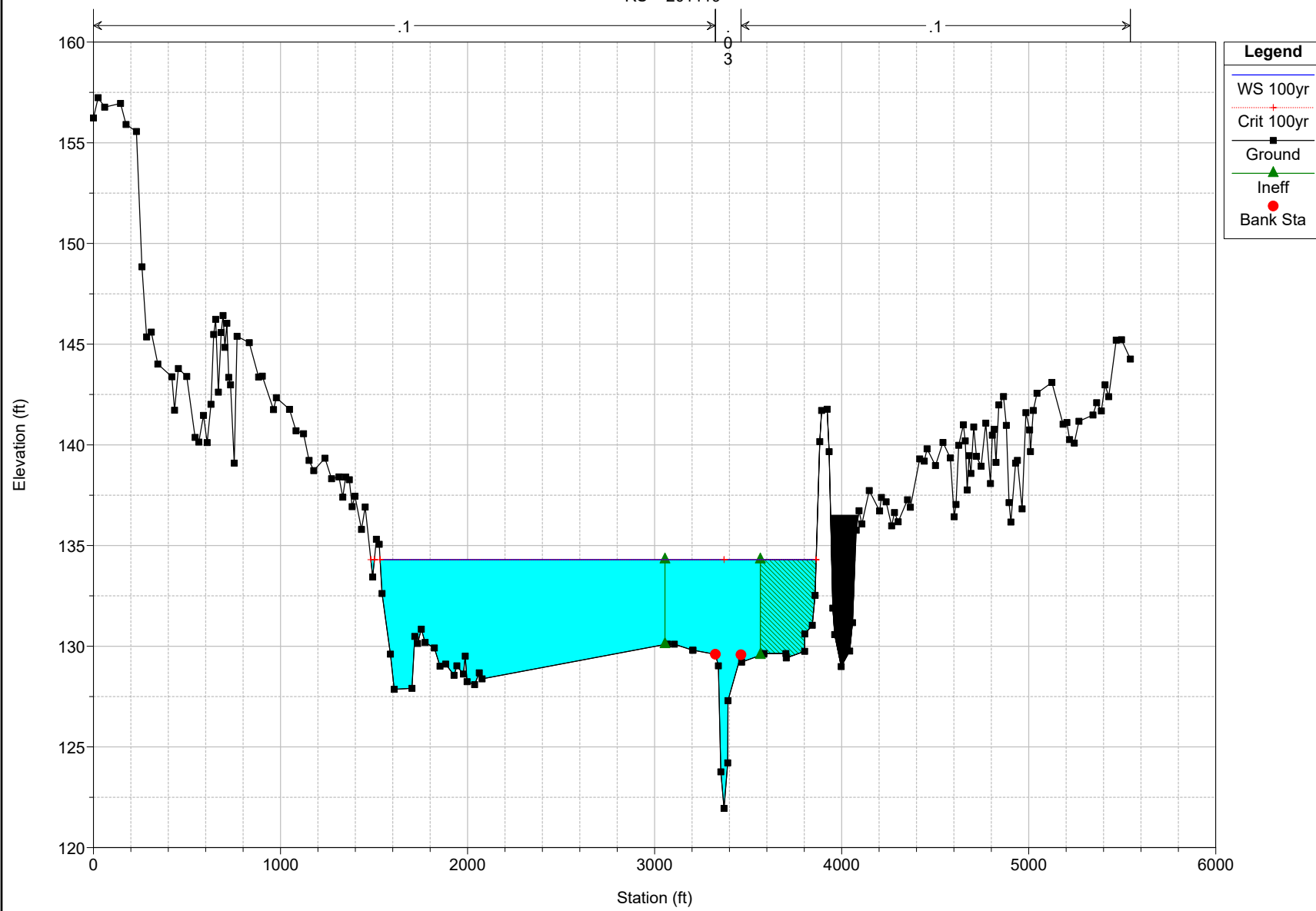
## **Appendix E**

### **Proposed 100-yr Storm Cross Sections**



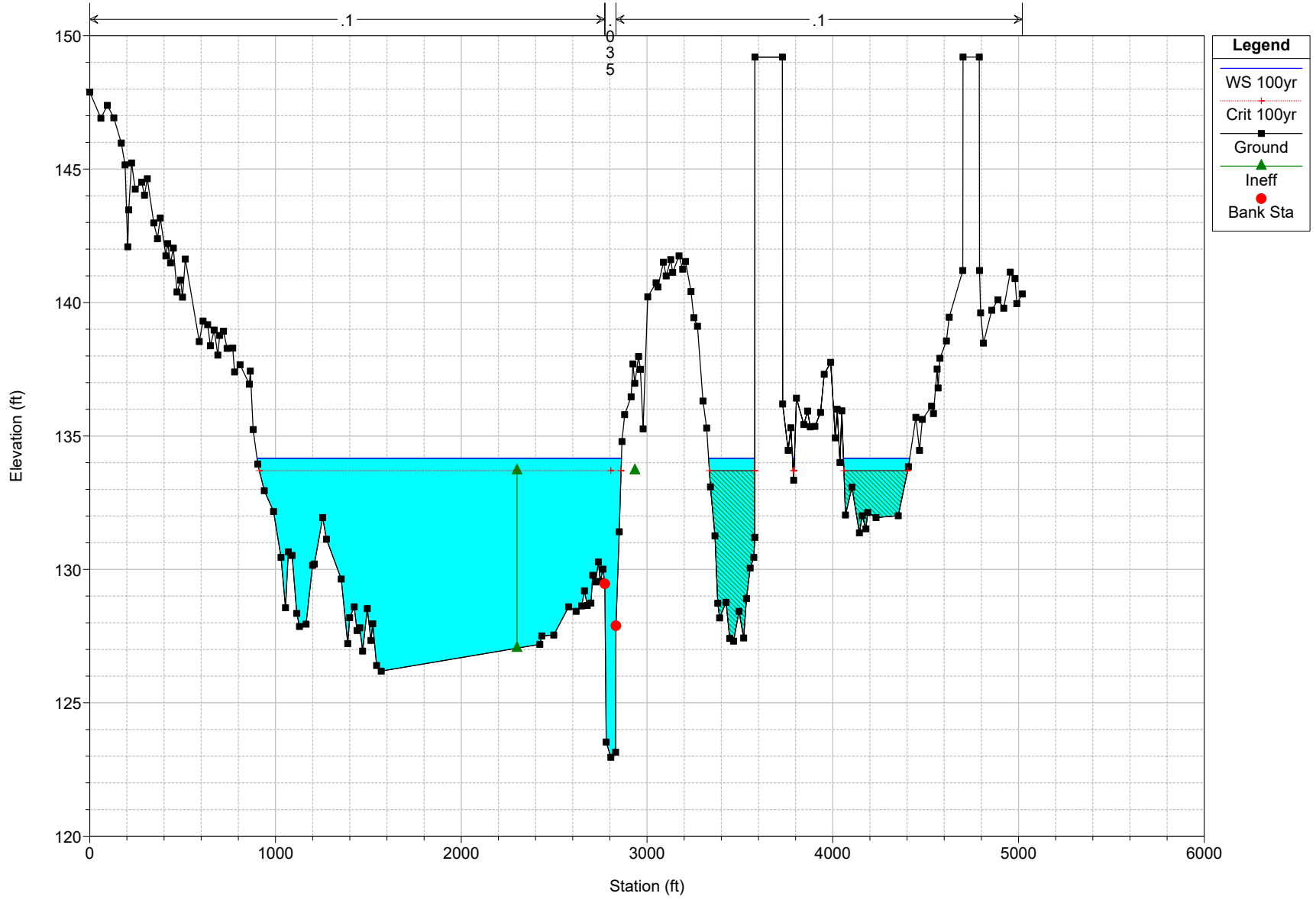
Patuxent River Plan: Plan 04 6/5/2019

RS = 201119

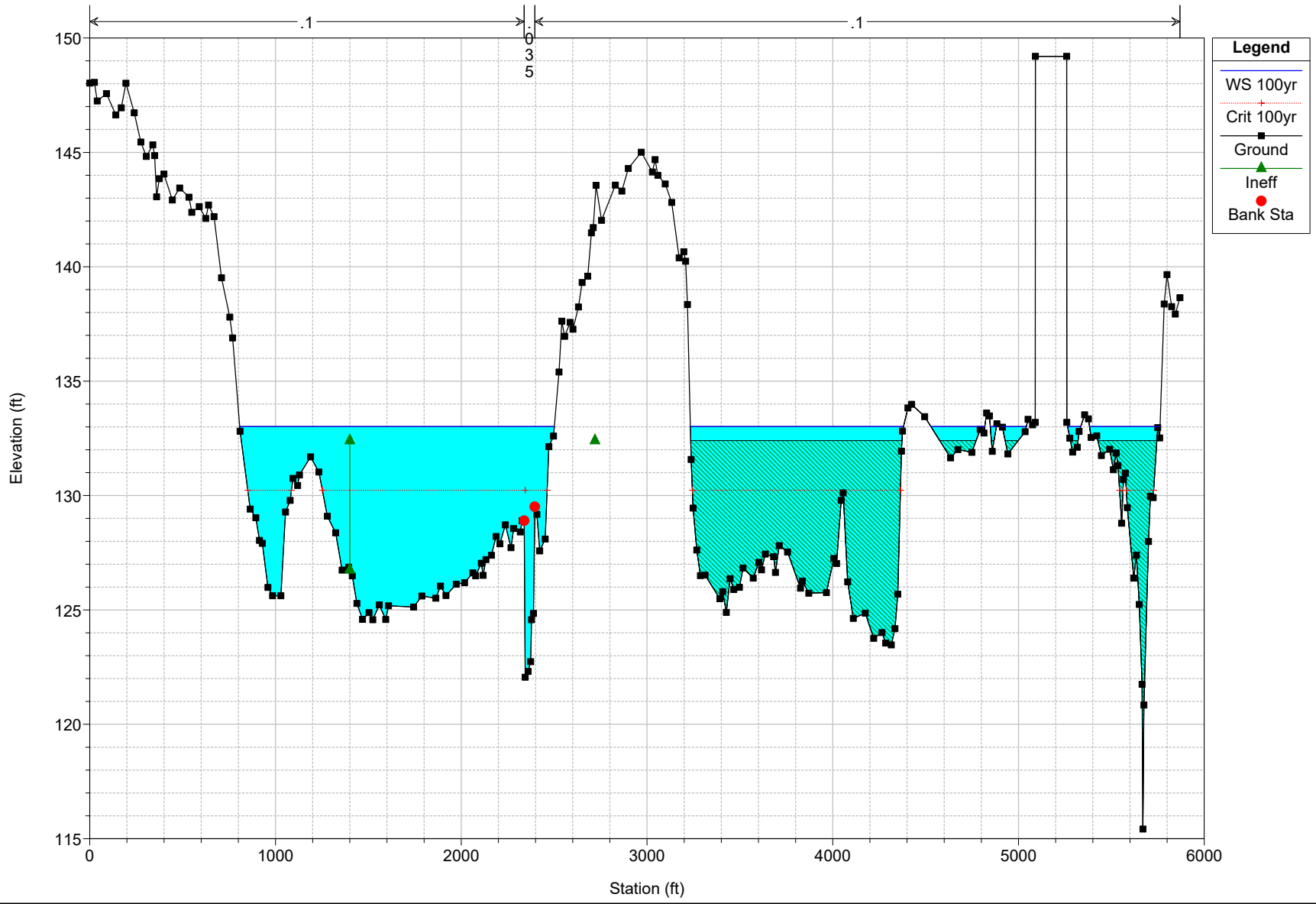


Patuxent River Plan: Plan 04 6/5/2019

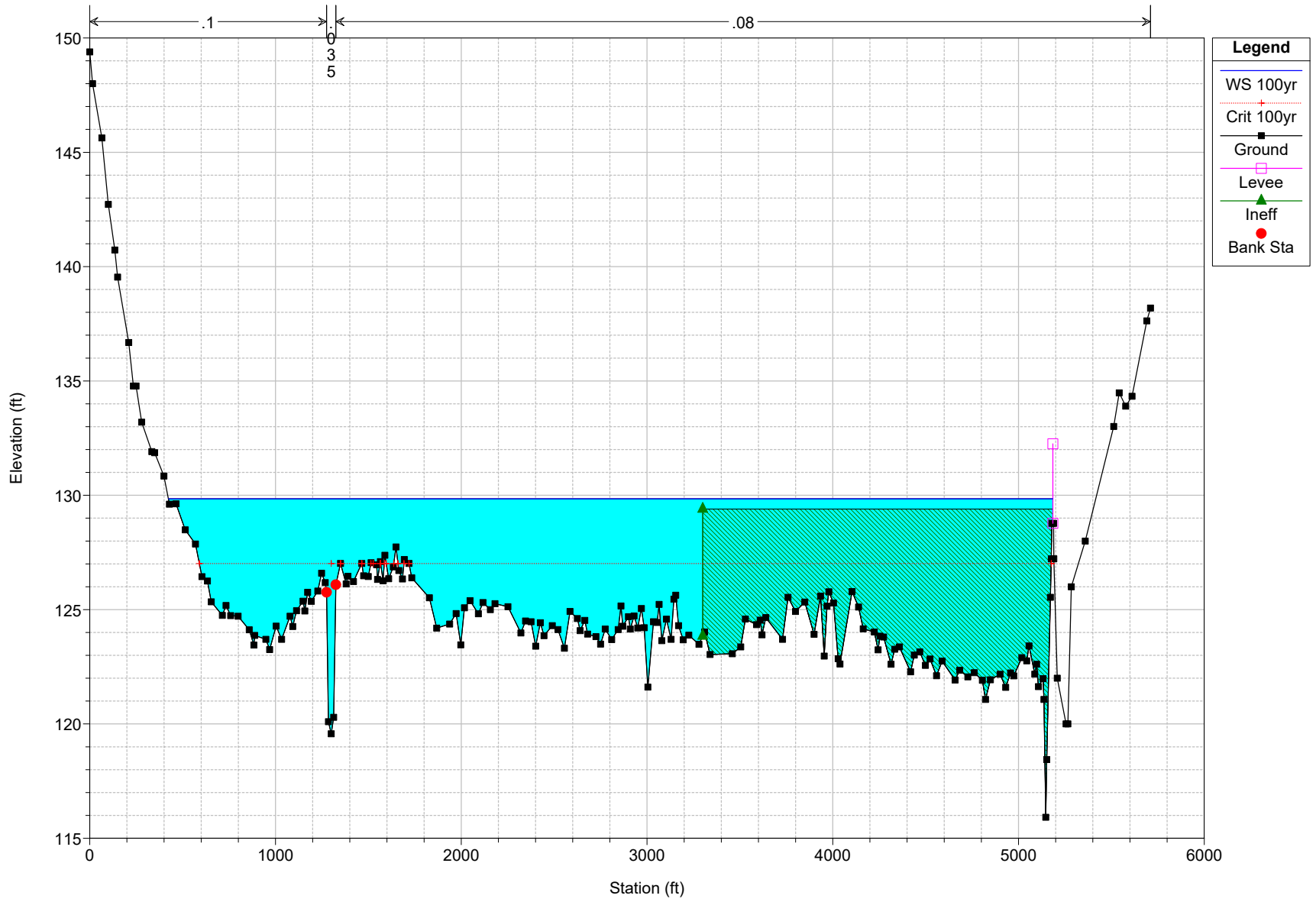
RS = 201058.7



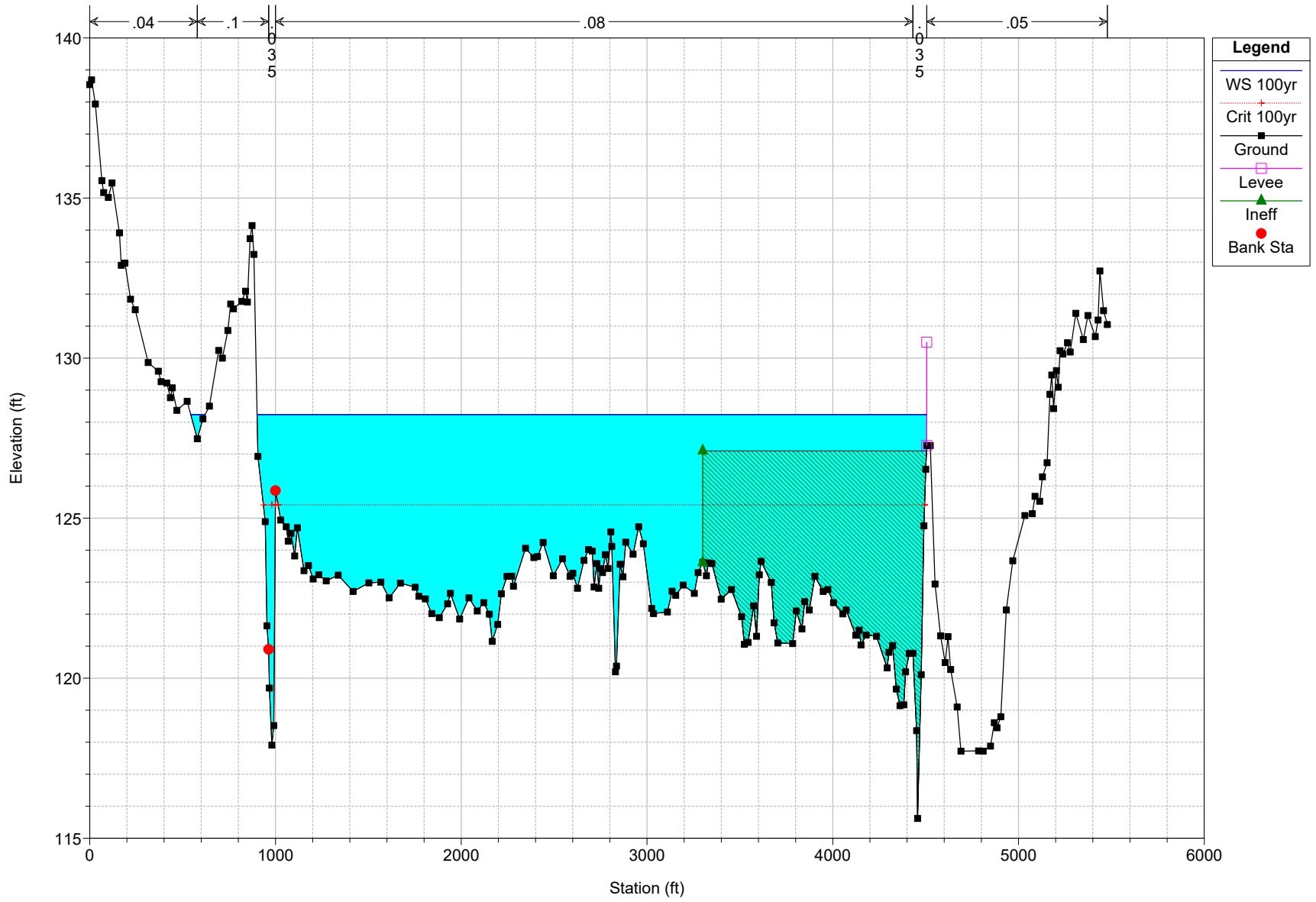
Patuxent River Plan: Plan 04 6/5/2019  
RS = 200115.4



Patuxent River Plan: Plan 04 6/5/2019  
RS = 198588.0

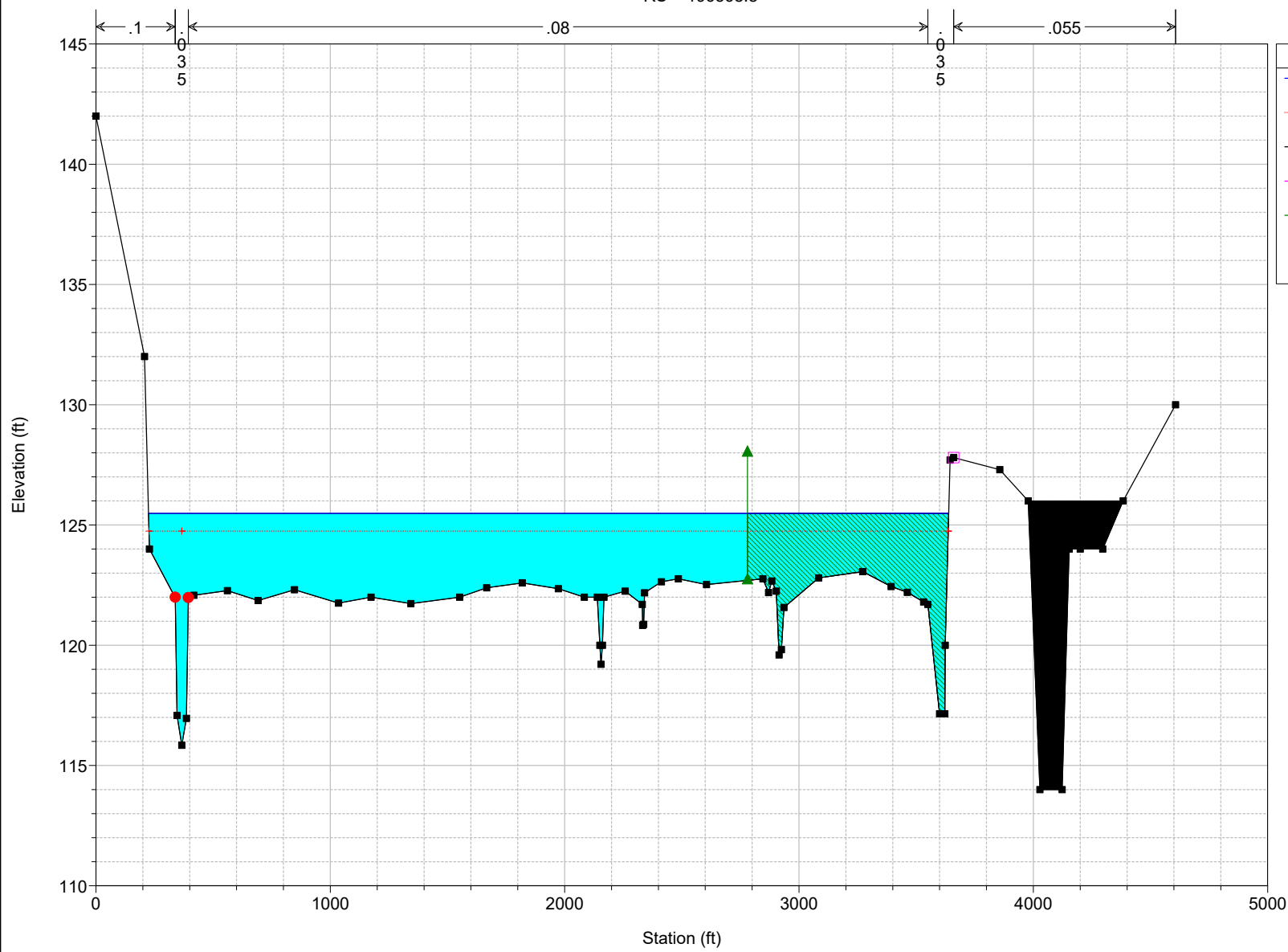


Patuxent River Plan: Plan 04 6/5/2019  
RS = 197599.6



Patuxent River Plan: Plan 04 6/5/2019

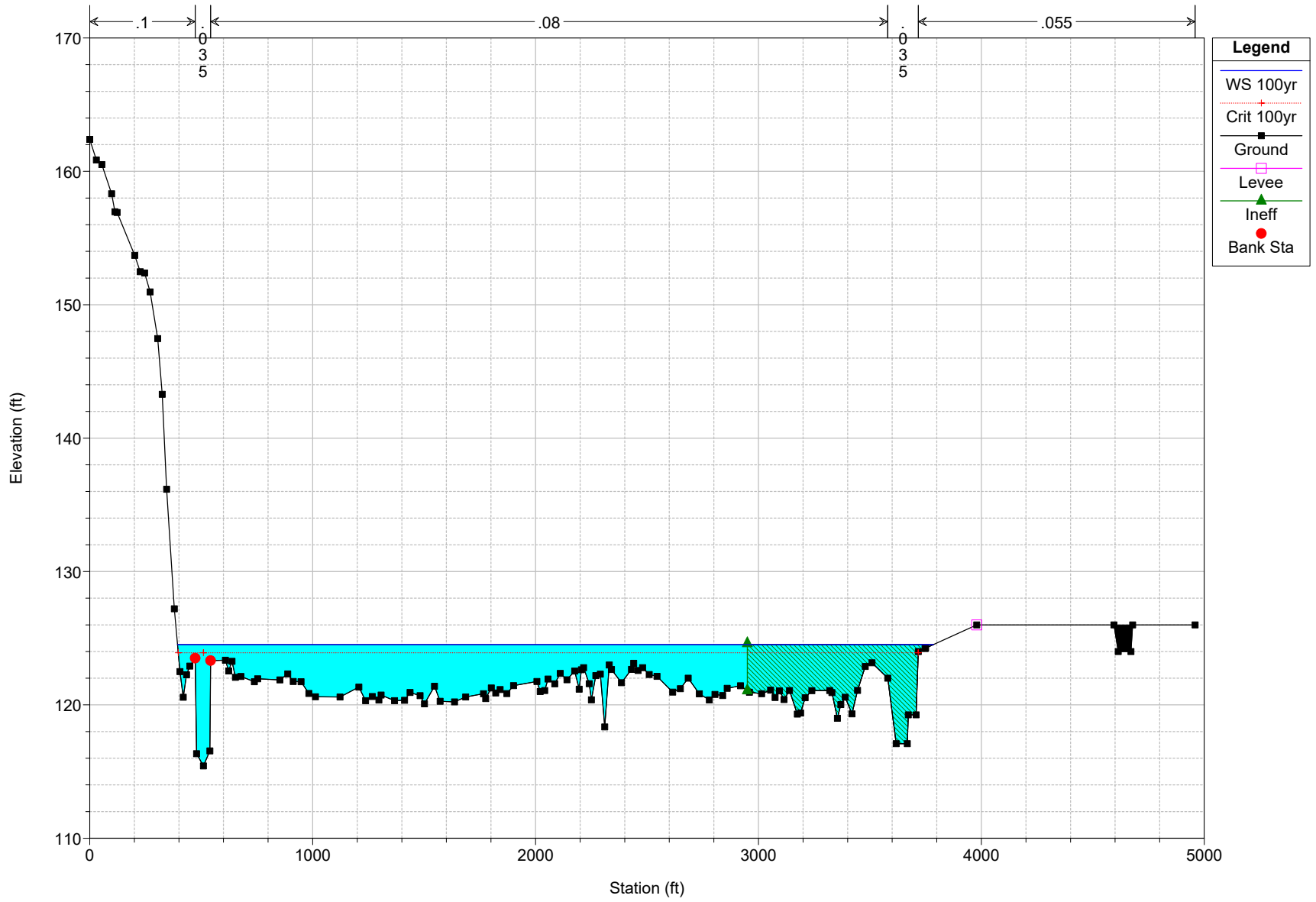
RS = 196568.8



**Legend**

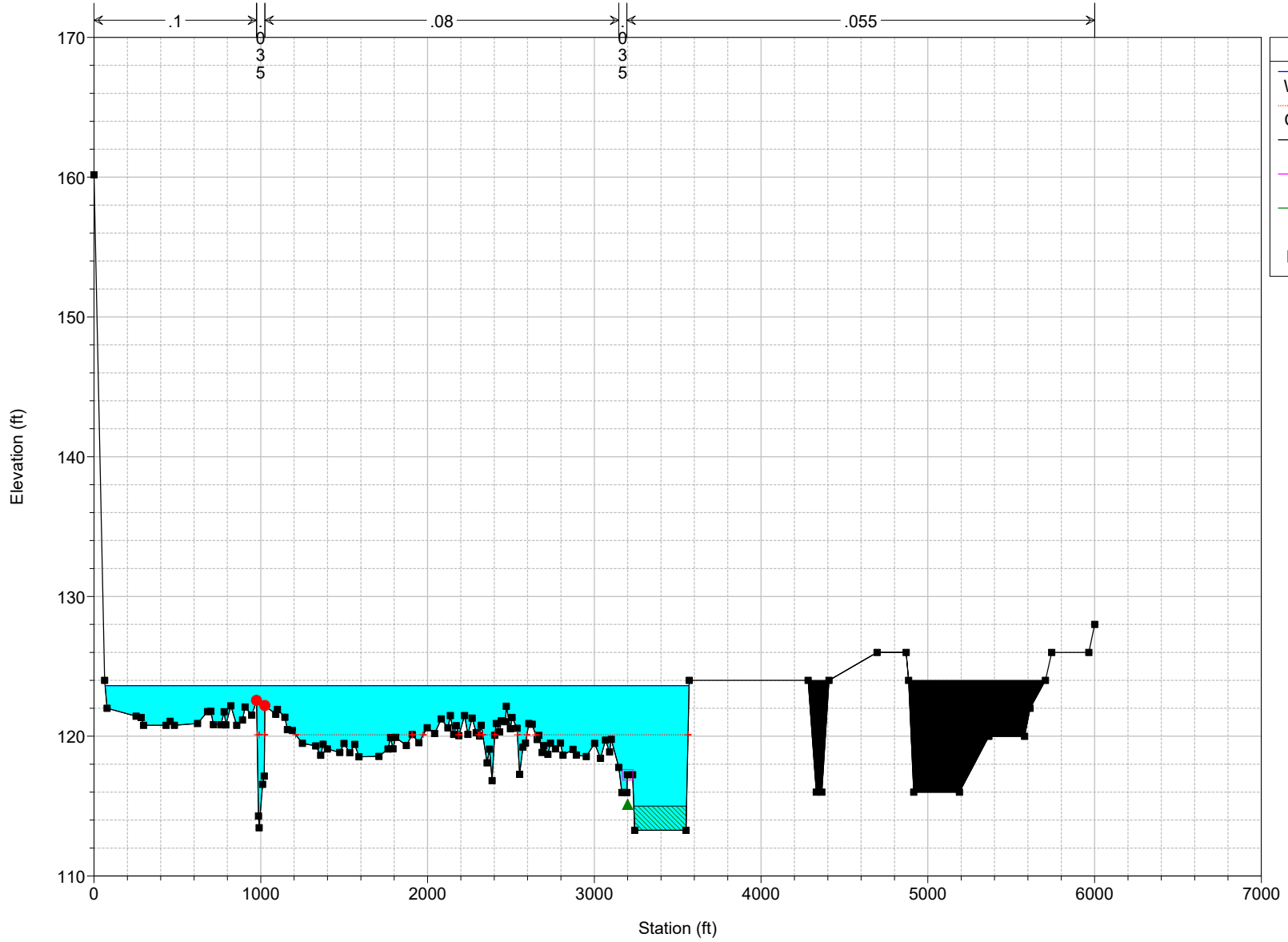
- WS 100yr
- Crit 100yr
- Ground
- Levee
- Ineff
- Bank Sta

Patuxent River Plan: Plan 04 6/5/2019  
RS = 196356.8



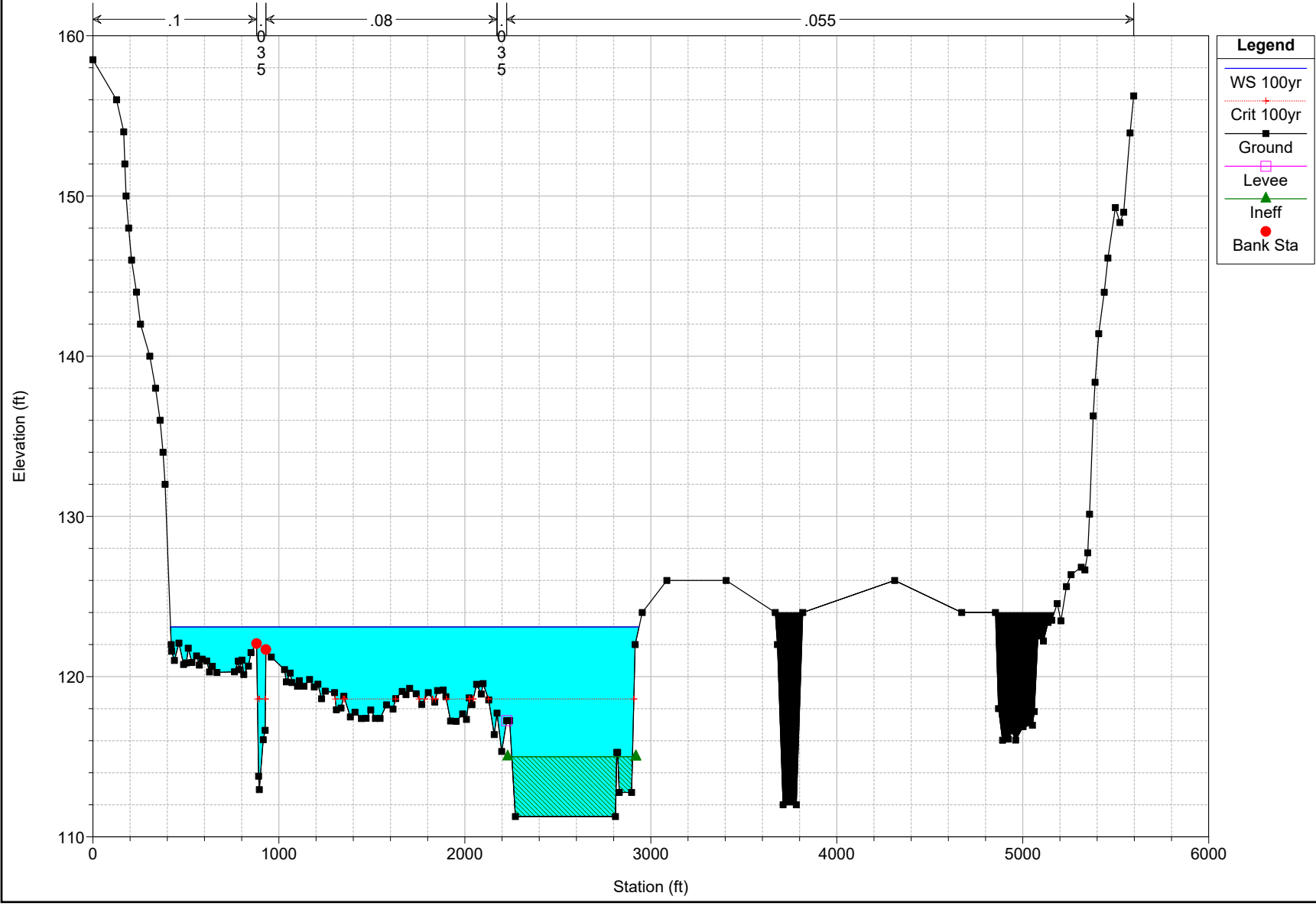
Patuxent River Plan: Plan 04 6/5/2019

RS = 195583.1

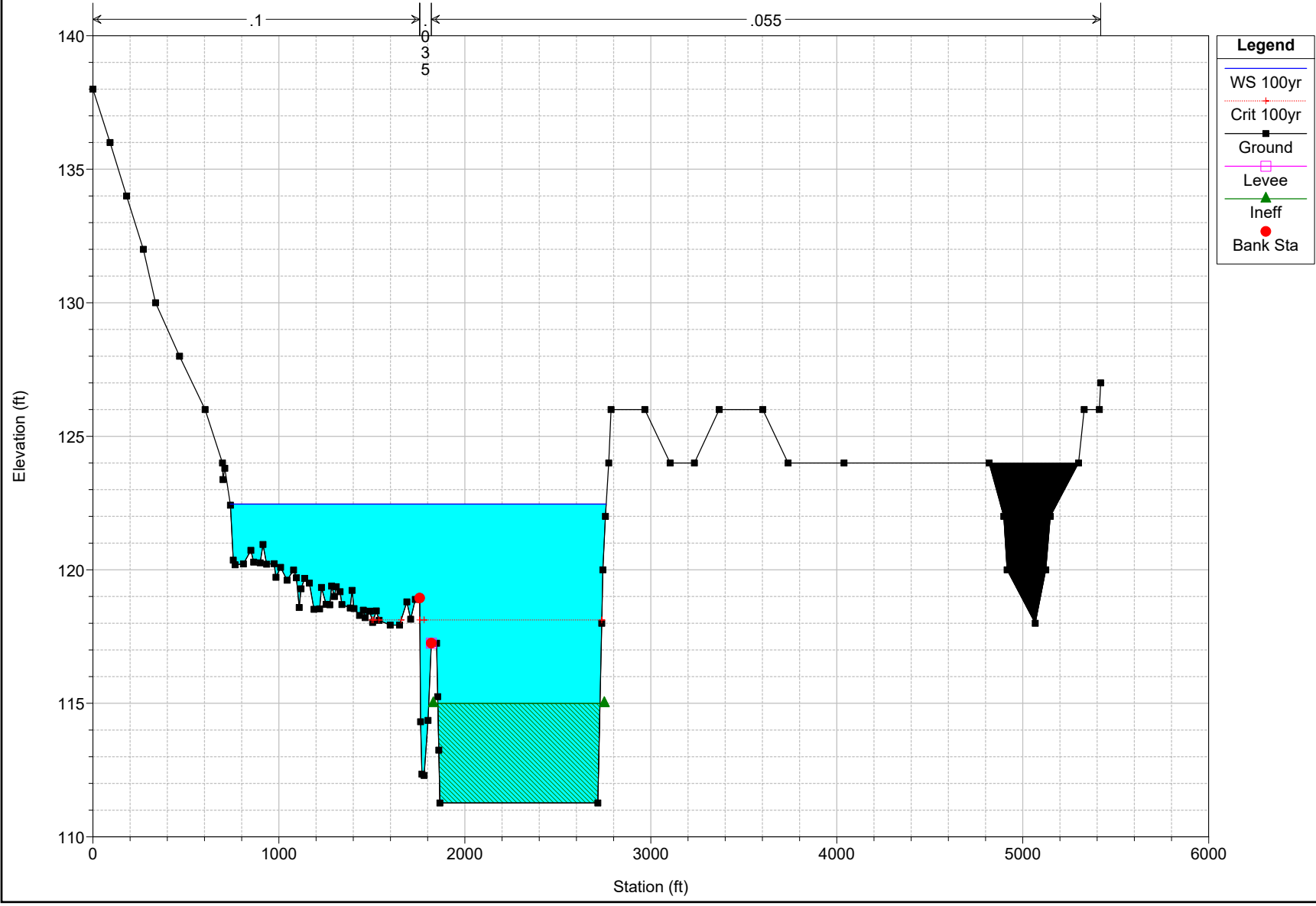




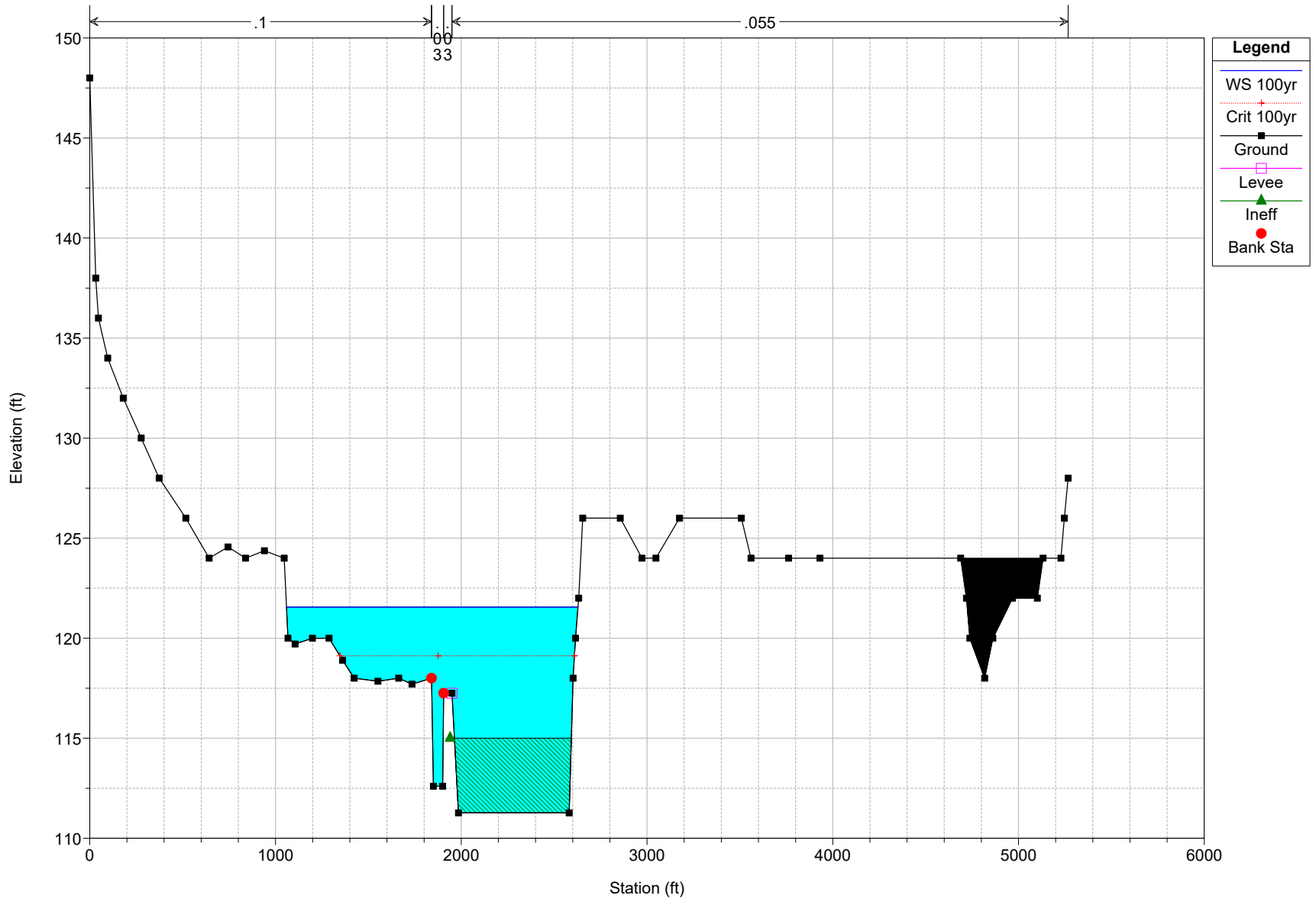
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 194817.8



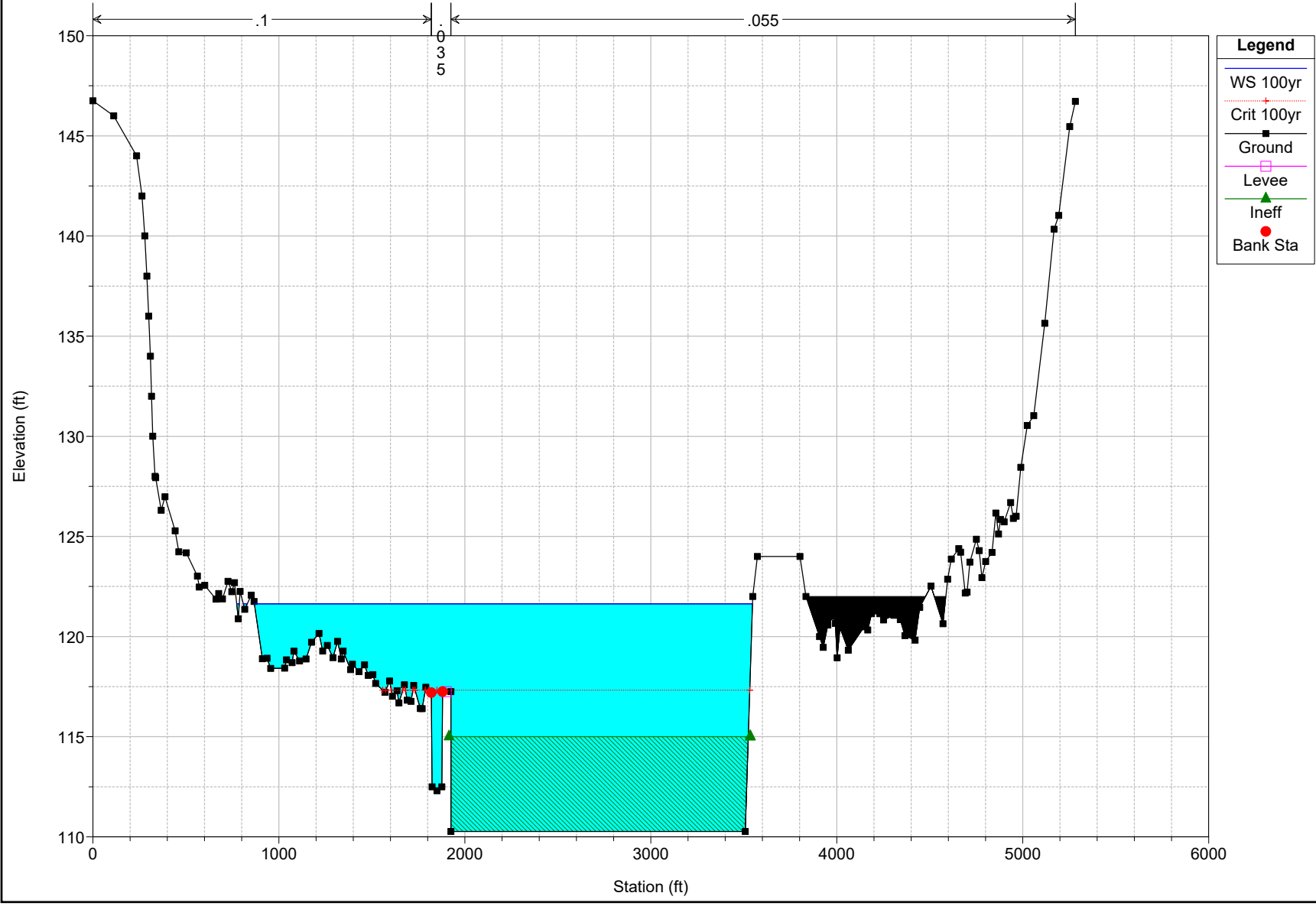
Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193854.4



Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193357.9

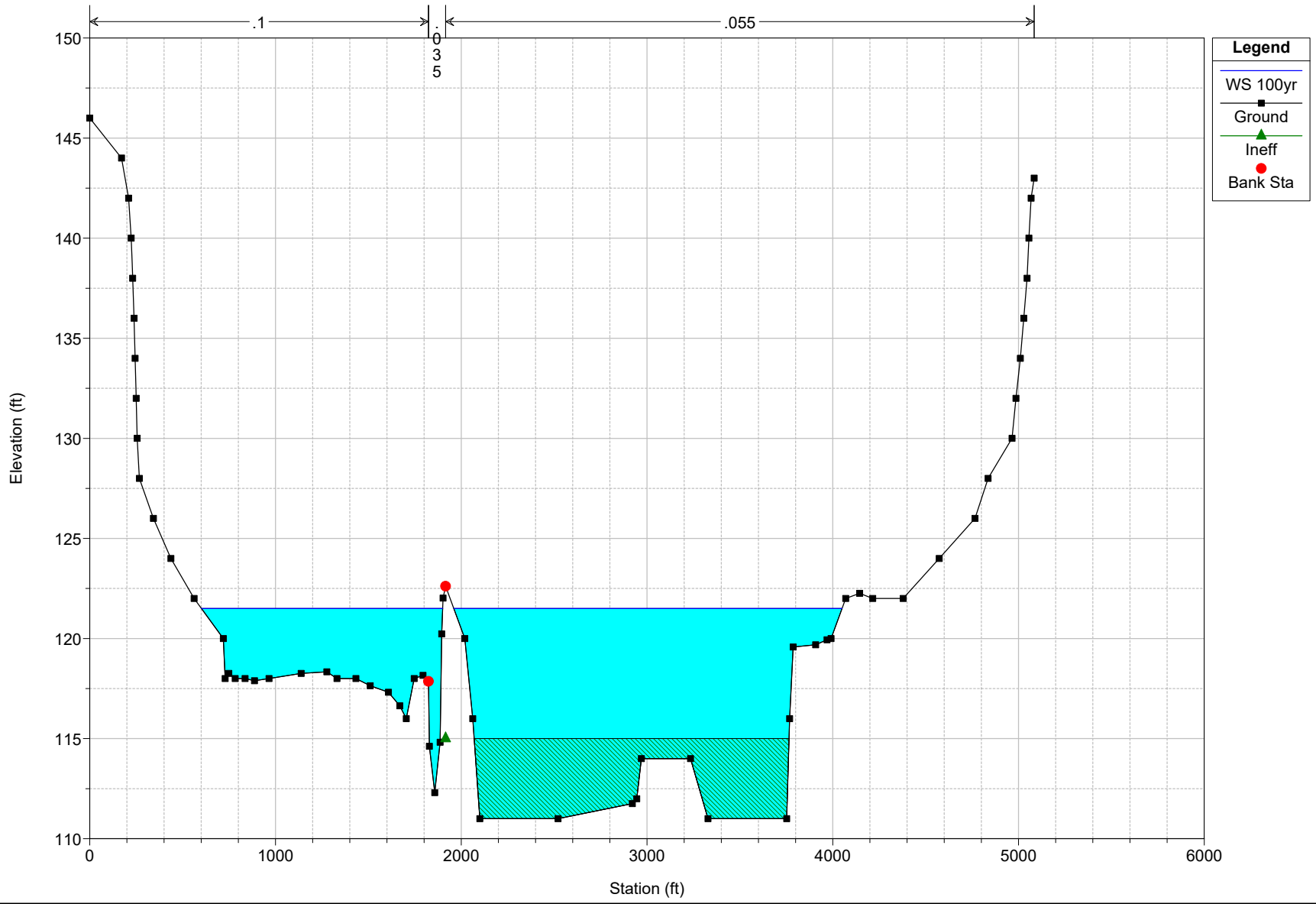


Patuxent River Plan: Plan 04 6/5/2019  
 RS = 193176.6

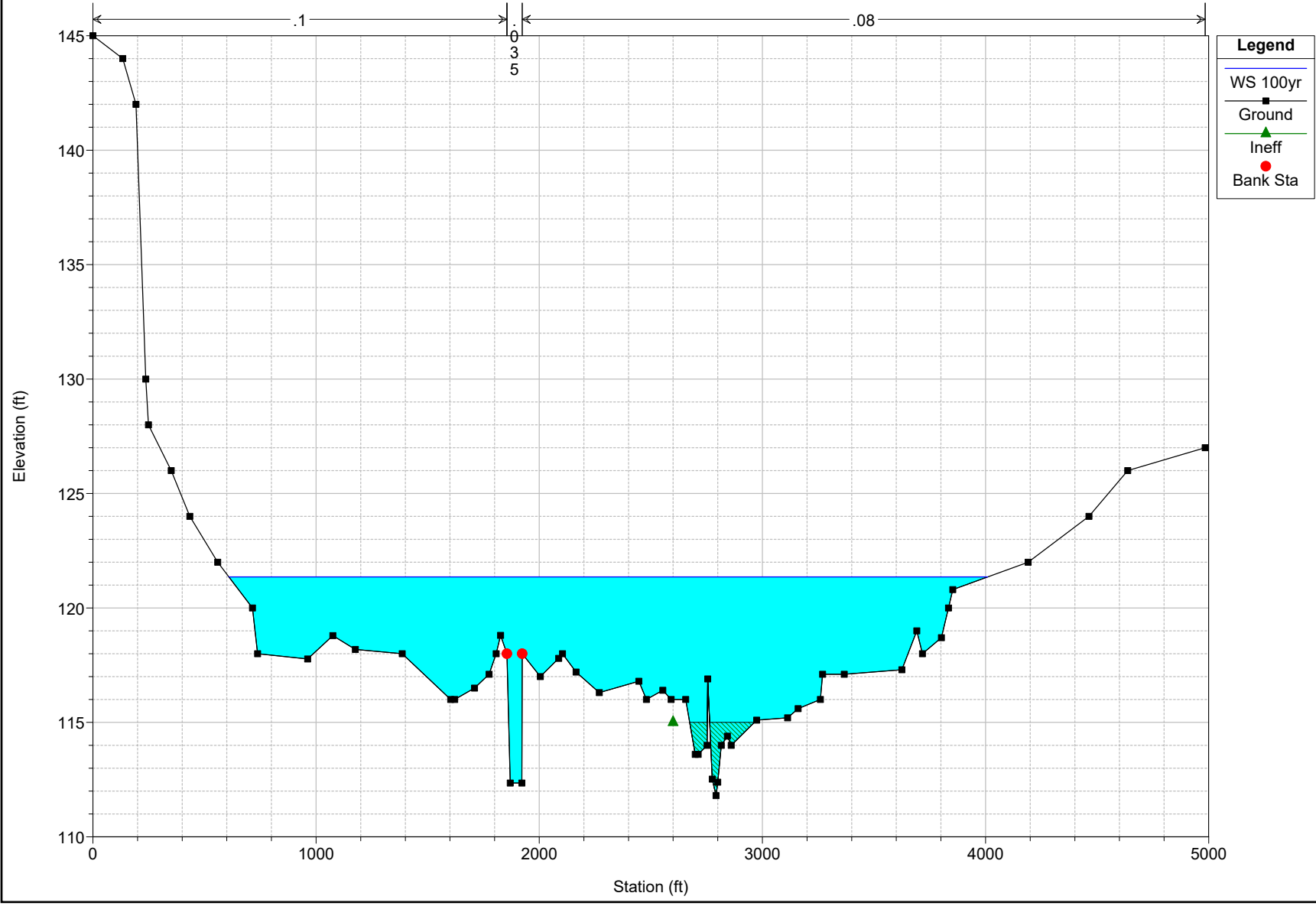


Legend	
WS 100yr	— (solid blue line)
Crit 100yr	- - - (red dashed line)
Ground	— (black line with square markers)
Levee	— (cyan shaded area)
Ineff	— (hatched cyan area)
Bank Sta	• (red dot)

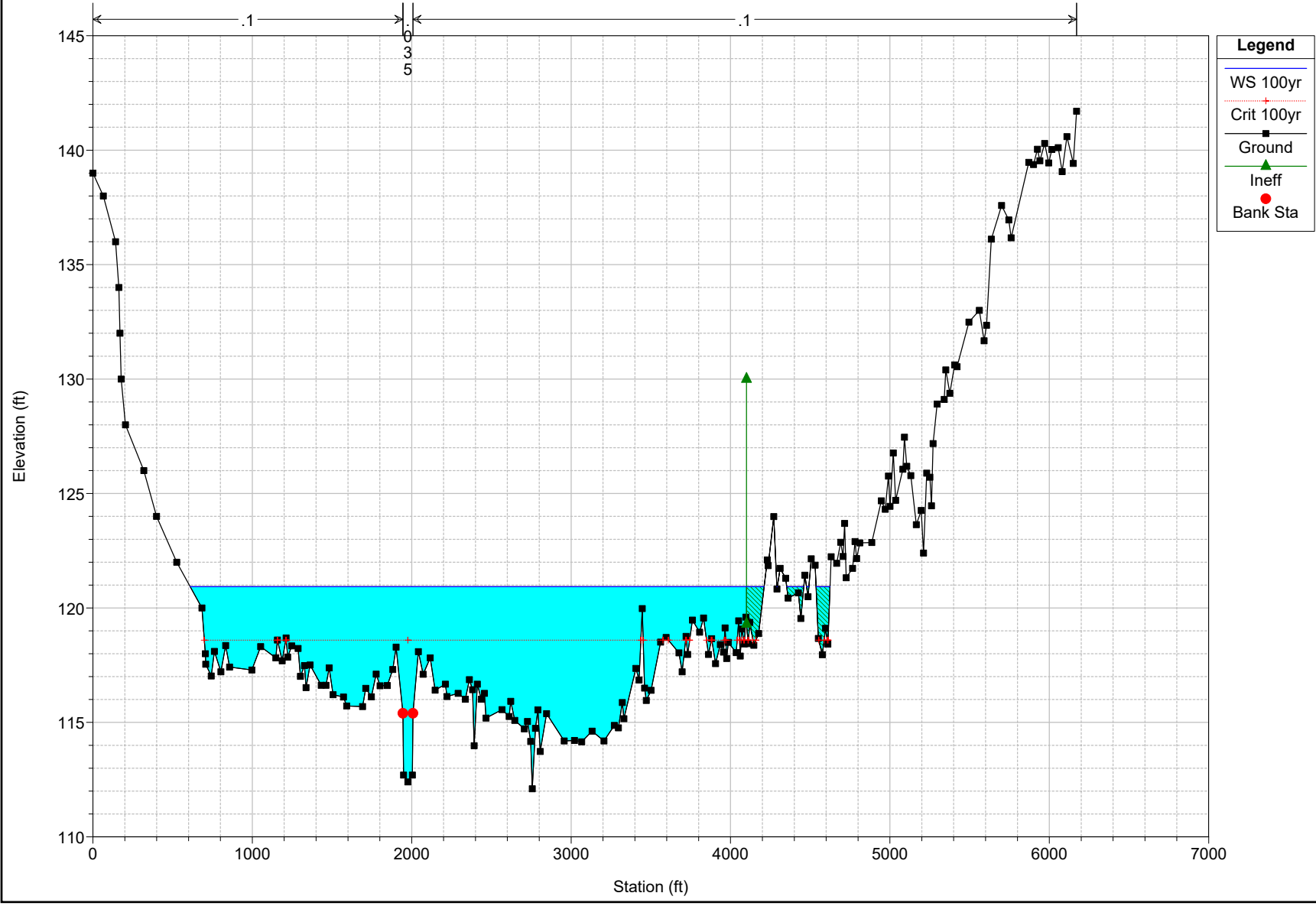
Patuxent River Plan: Plan 04 6/5/2019  
RS = 192867



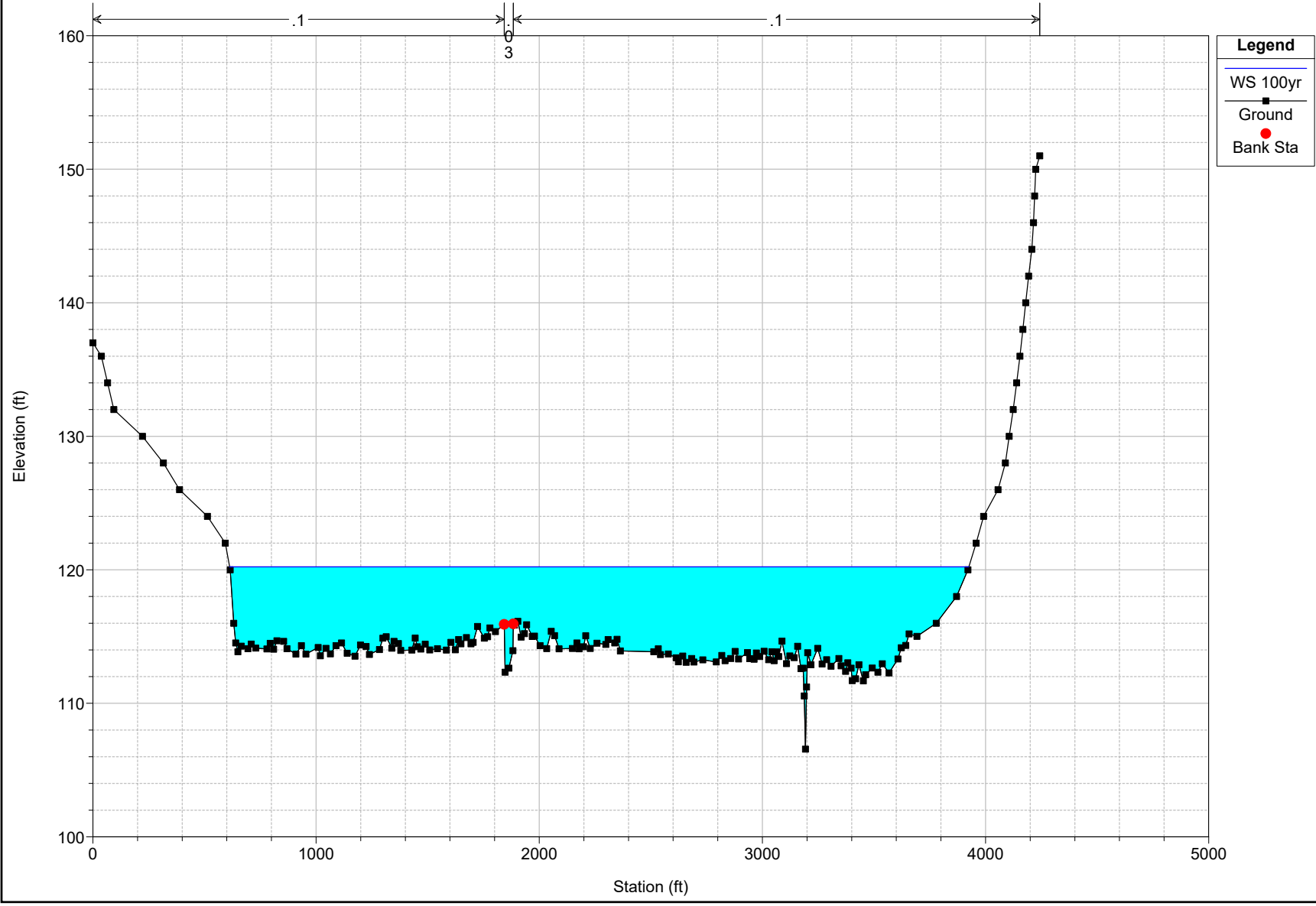
Patuxent River Plan: Plan 04 6/5/2019  
RS = 192774.7



Patuxent River Plan: Plan 04 6/5/2019  
RS = 192514.9

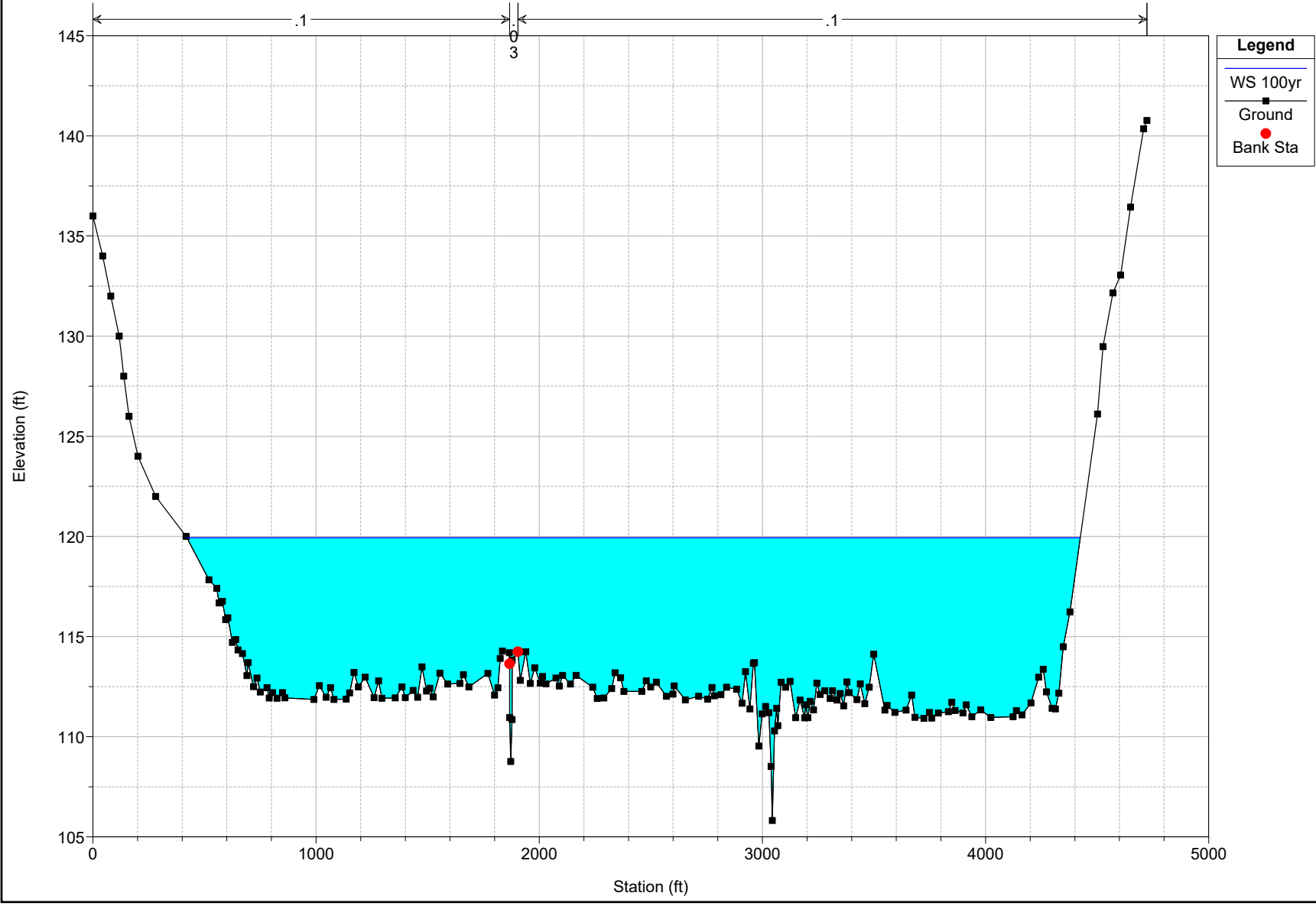


Patuxent River Plan: Plan 04 6/5/2019  
RS = 191681.5





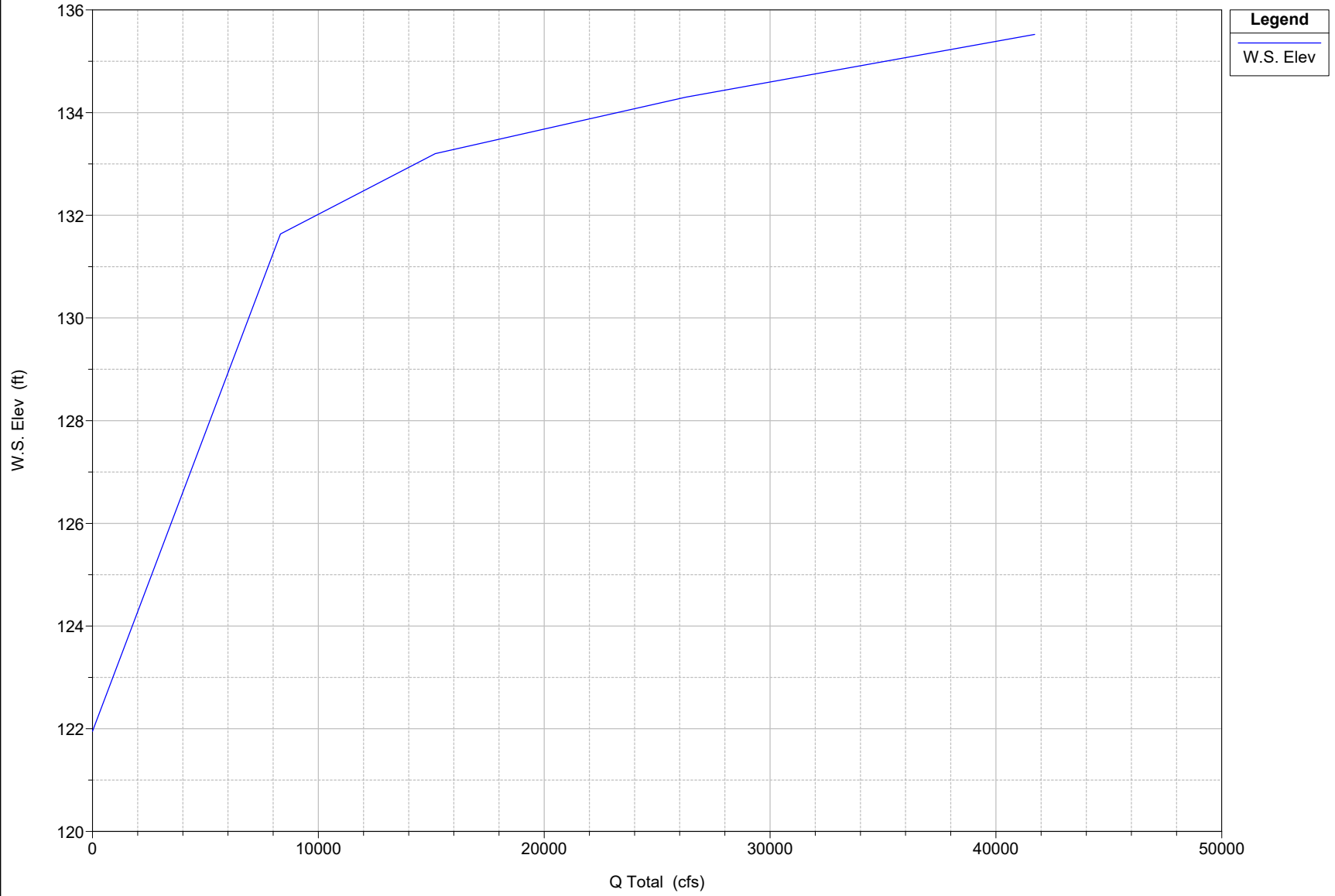
Patuxent River Plan: Plan 04 6/5/2019  
RS = 190879.0



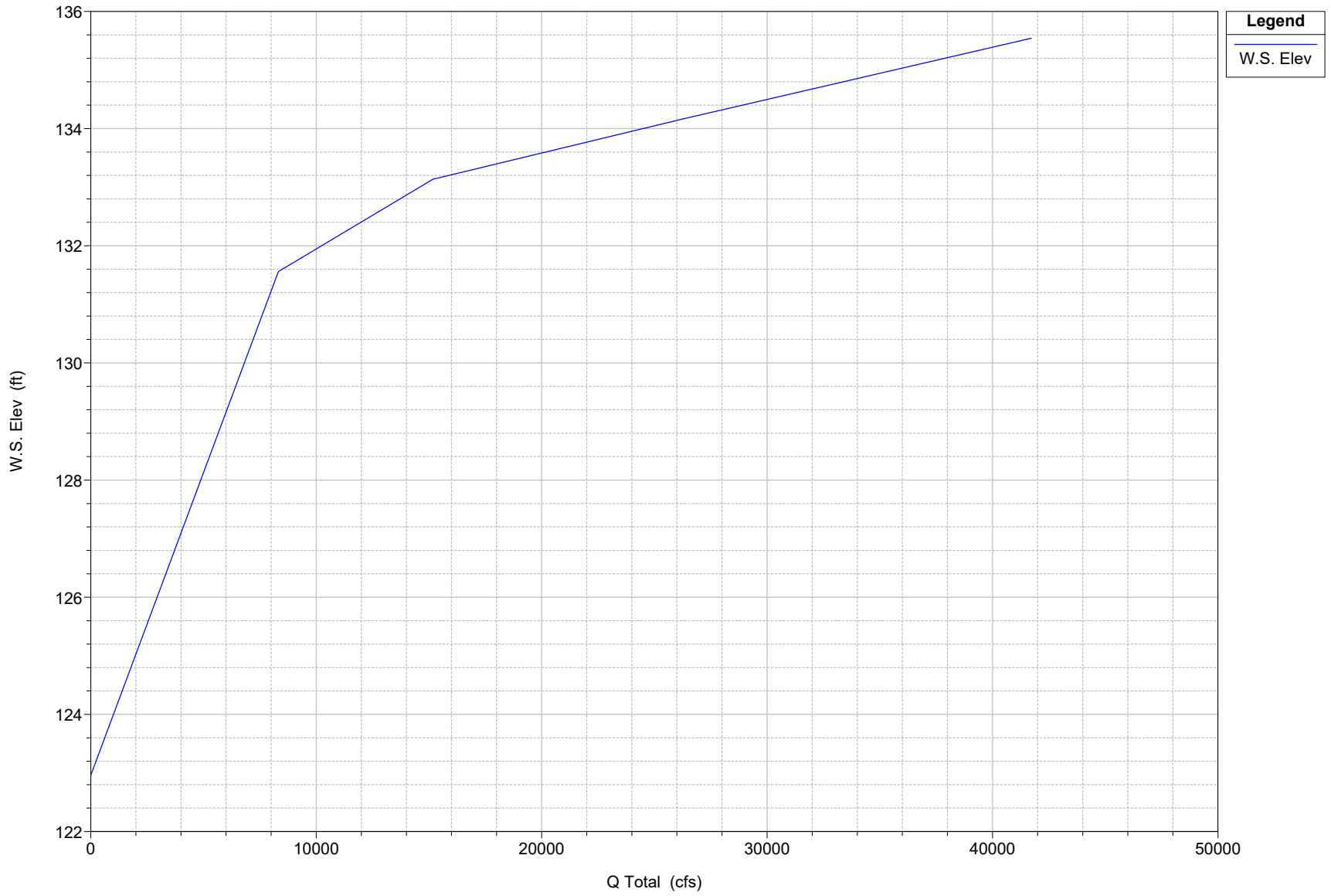
## **Appendix F**

### **Discharge Frequency Curves**

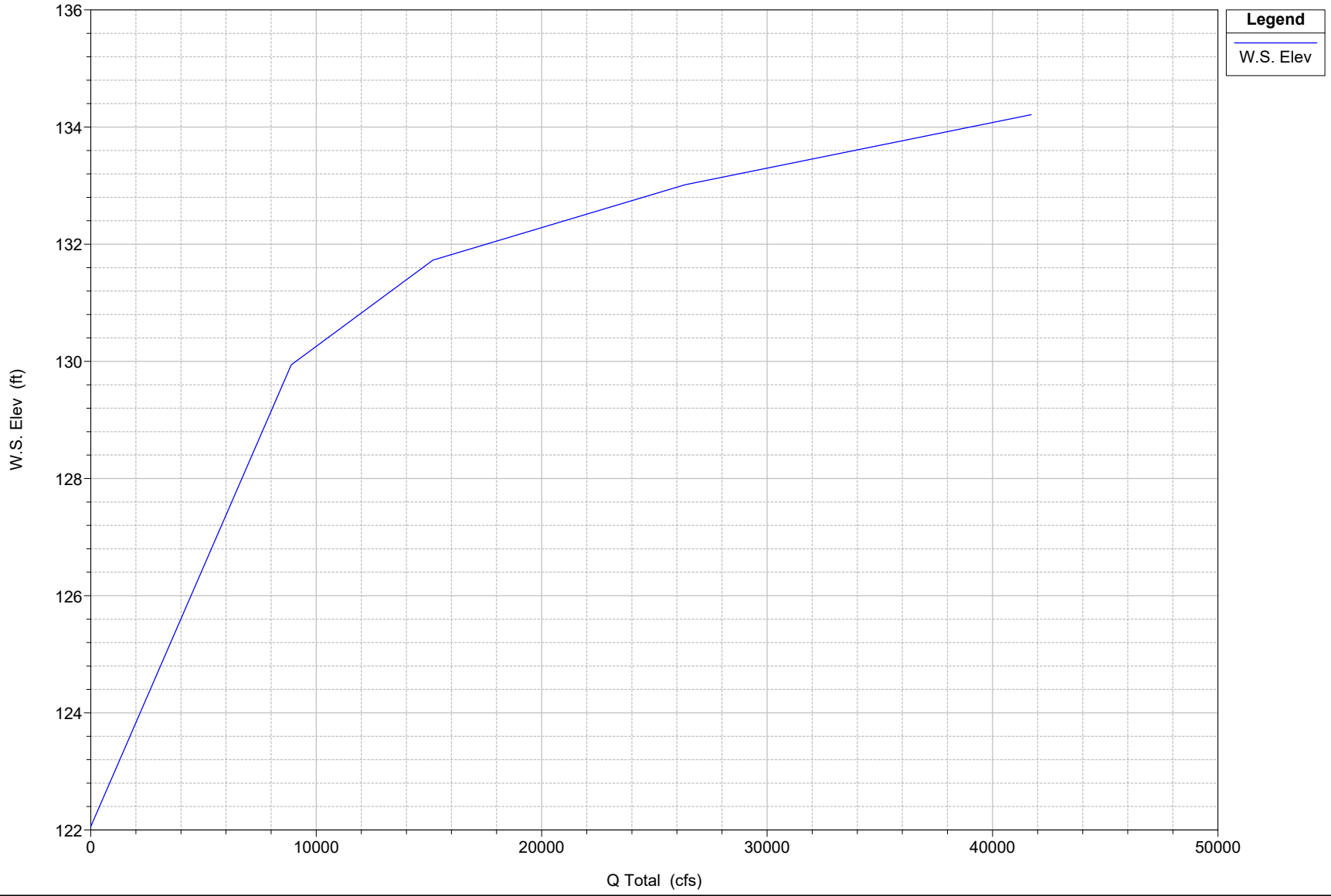
Patuxent River Plan: Plan 04 6/5/2019  
RS = 201119



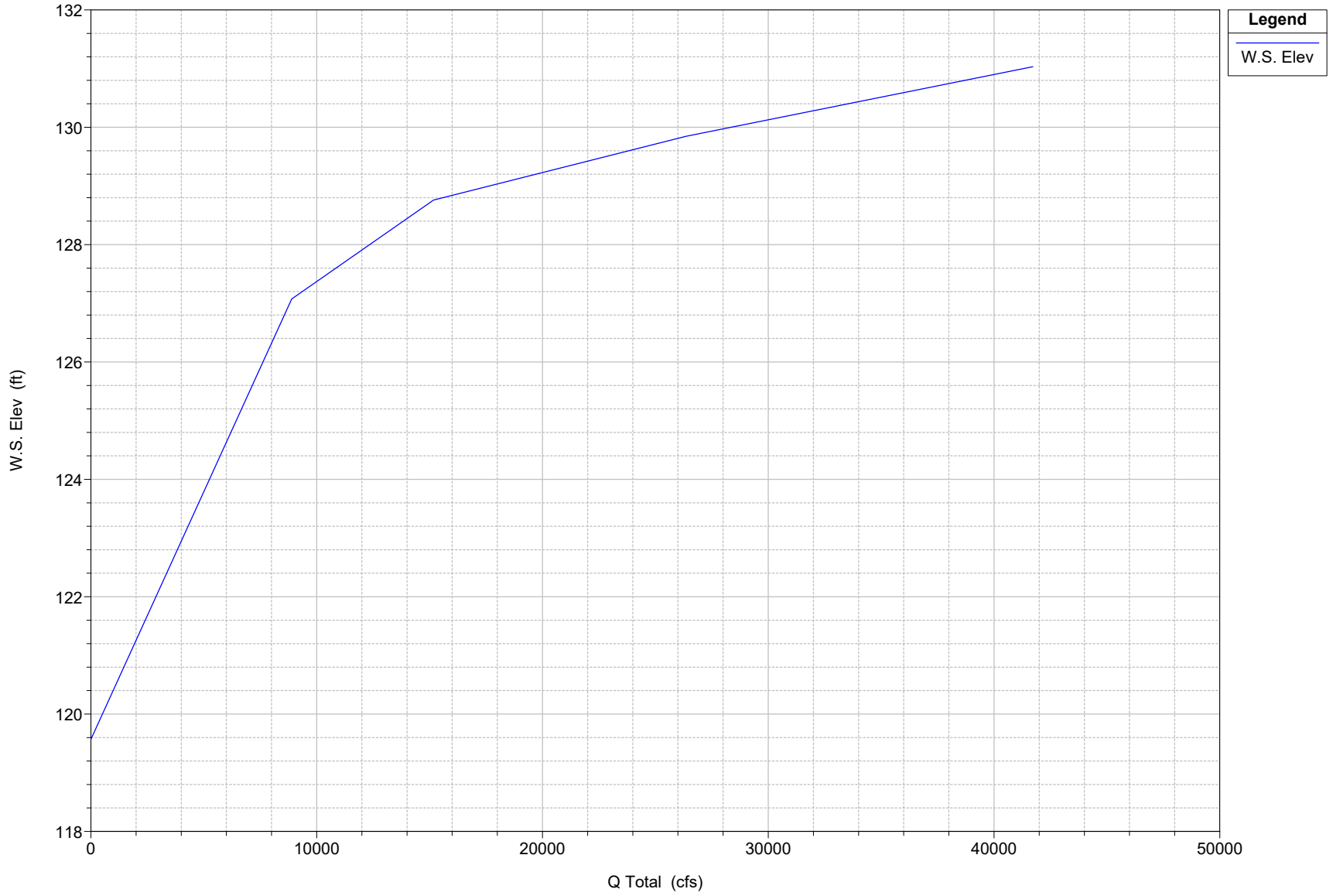
Patuxent River Plan: Plan 04 6/5/2019  
RS = 201058.7



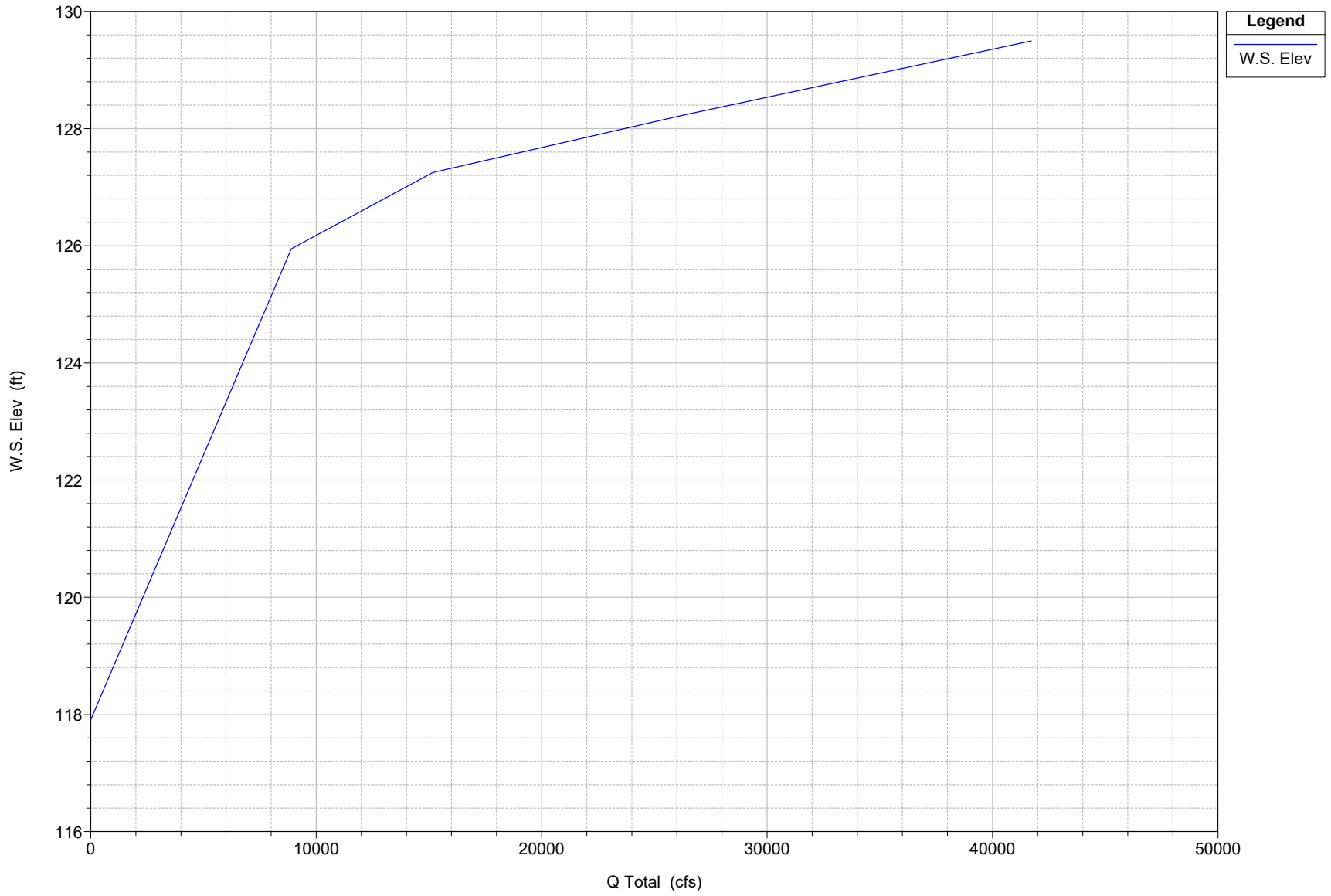
Patuxent River Plan: Plan 04 6/5/2019  
RS = 200115.4



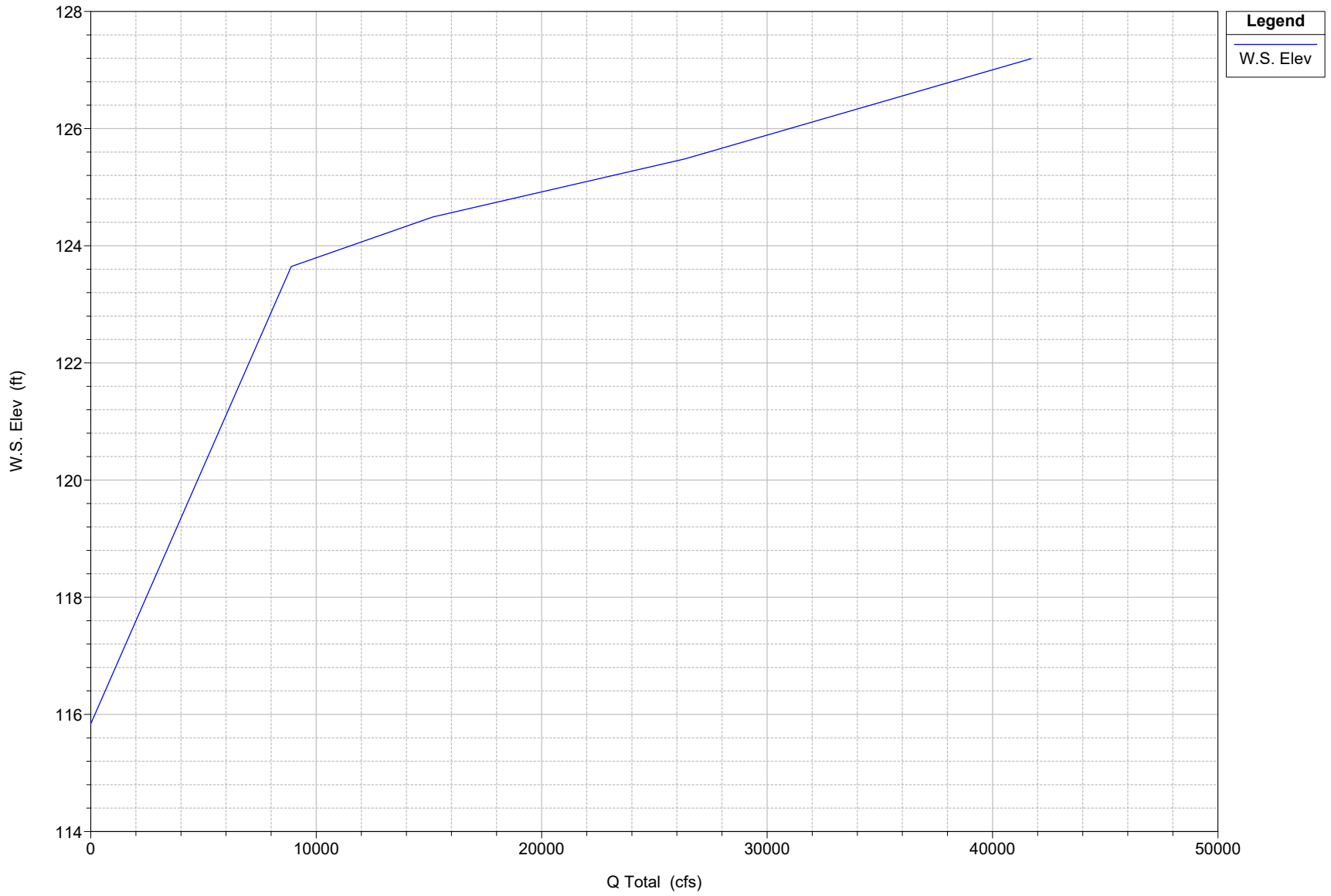
Patuxent River Plan: Plan 04 6/5/2019  
RS = 198588.0



Patuxent River Plan: Plan 04 6/5/2019  
RS = 197599.6

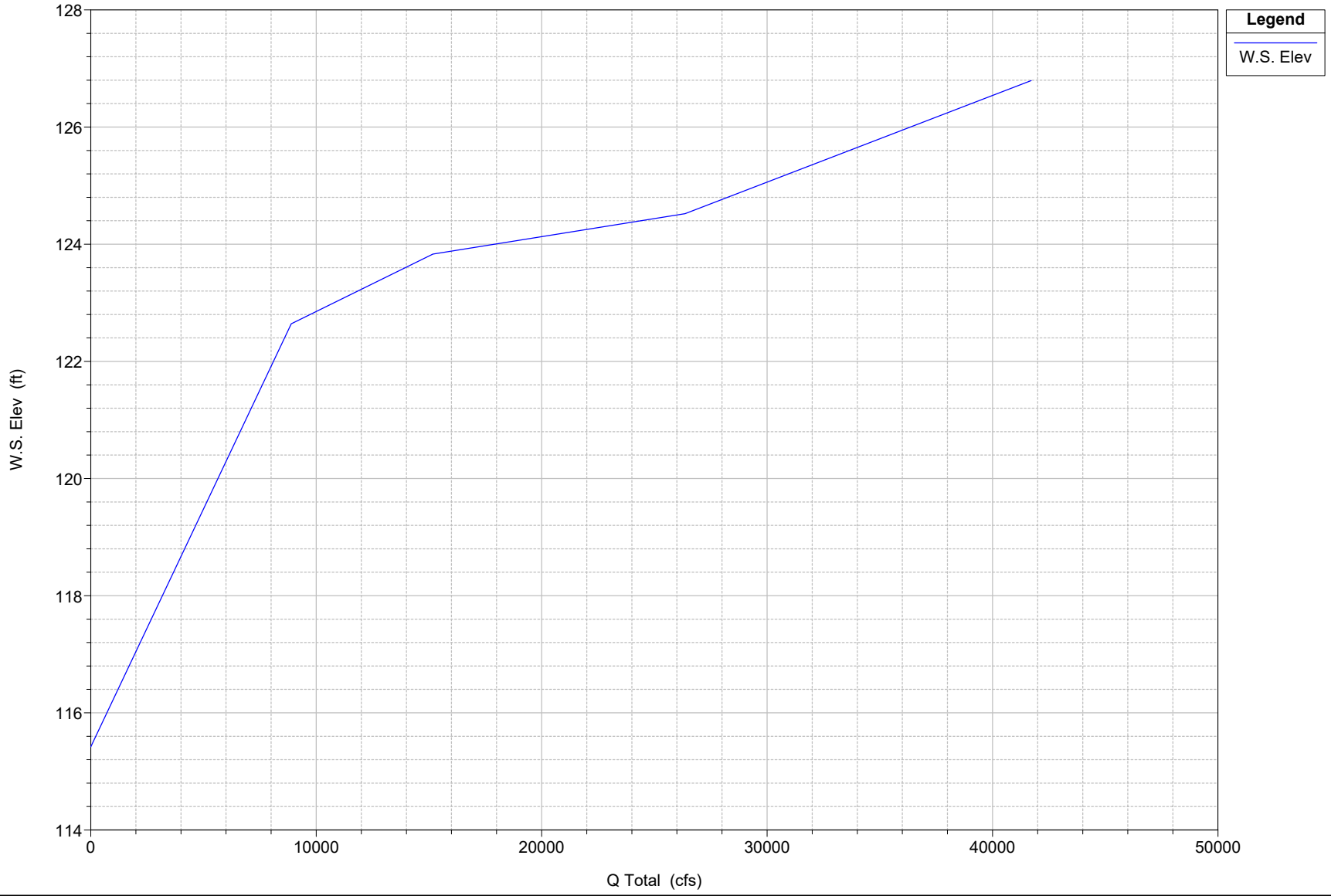


Patuxent River Plan: Plan 04 6/5/2019  
RS = 196568.8

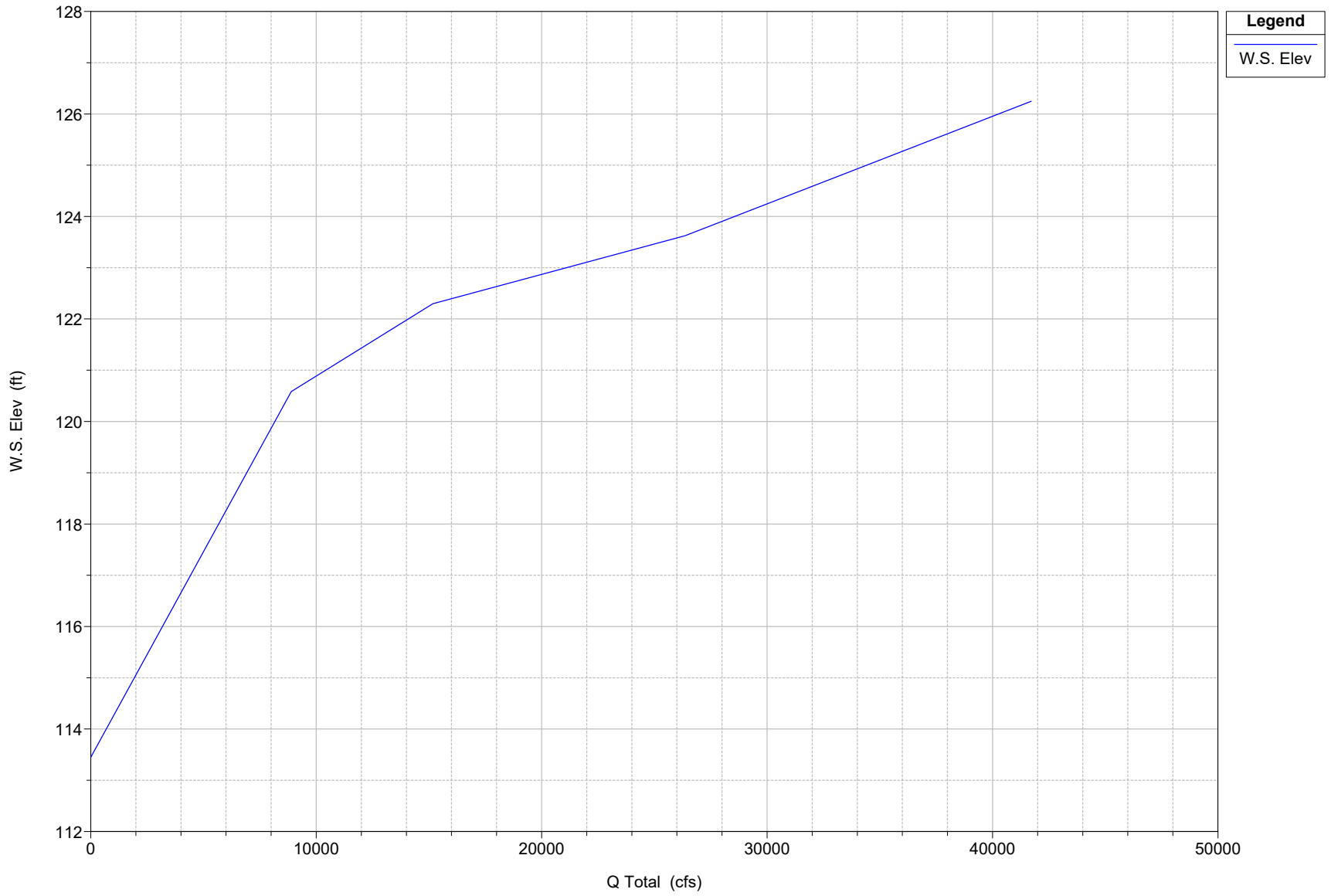




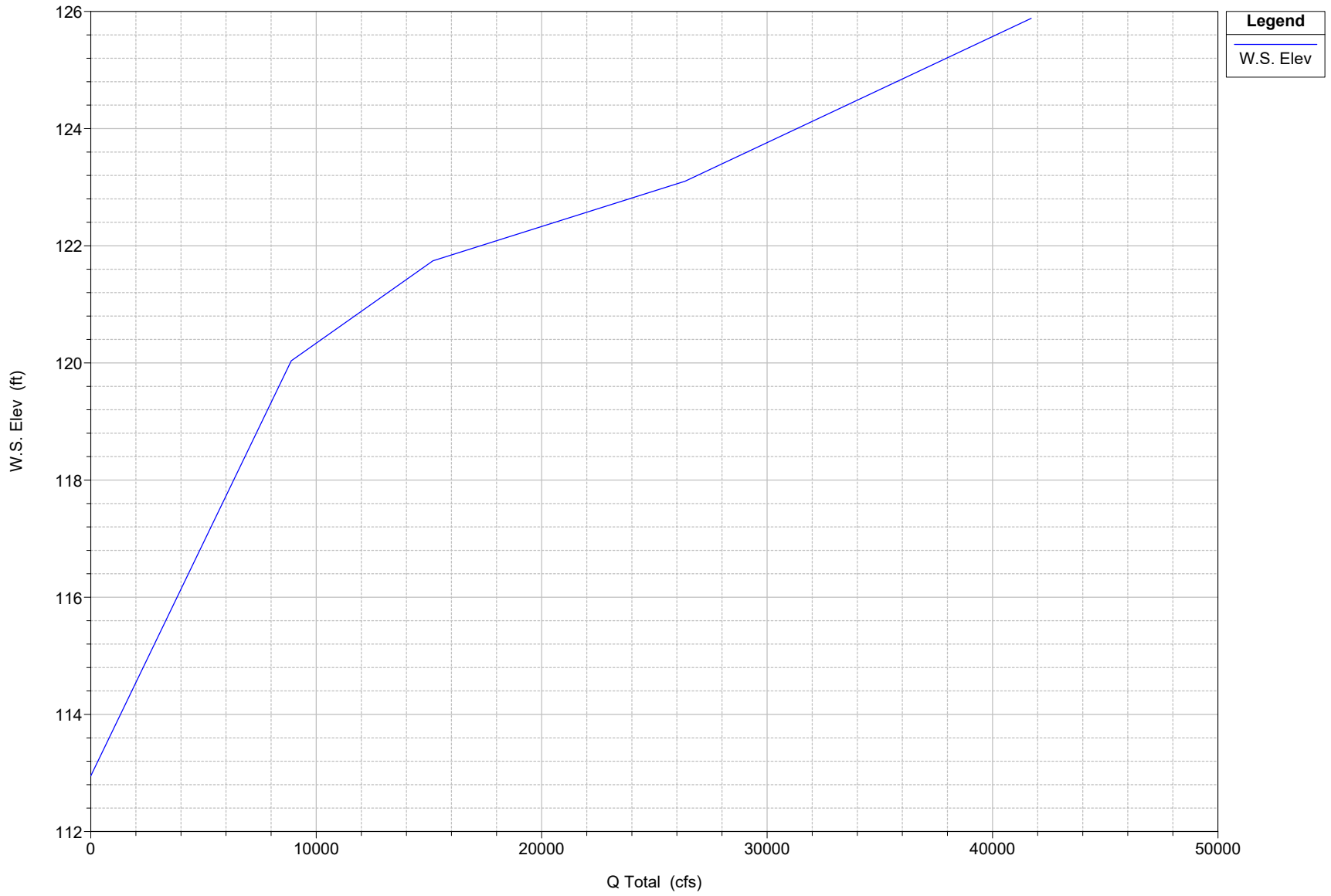
Patuxent River Plan: Plan 04 6/5/2019  
RS = 196356.8



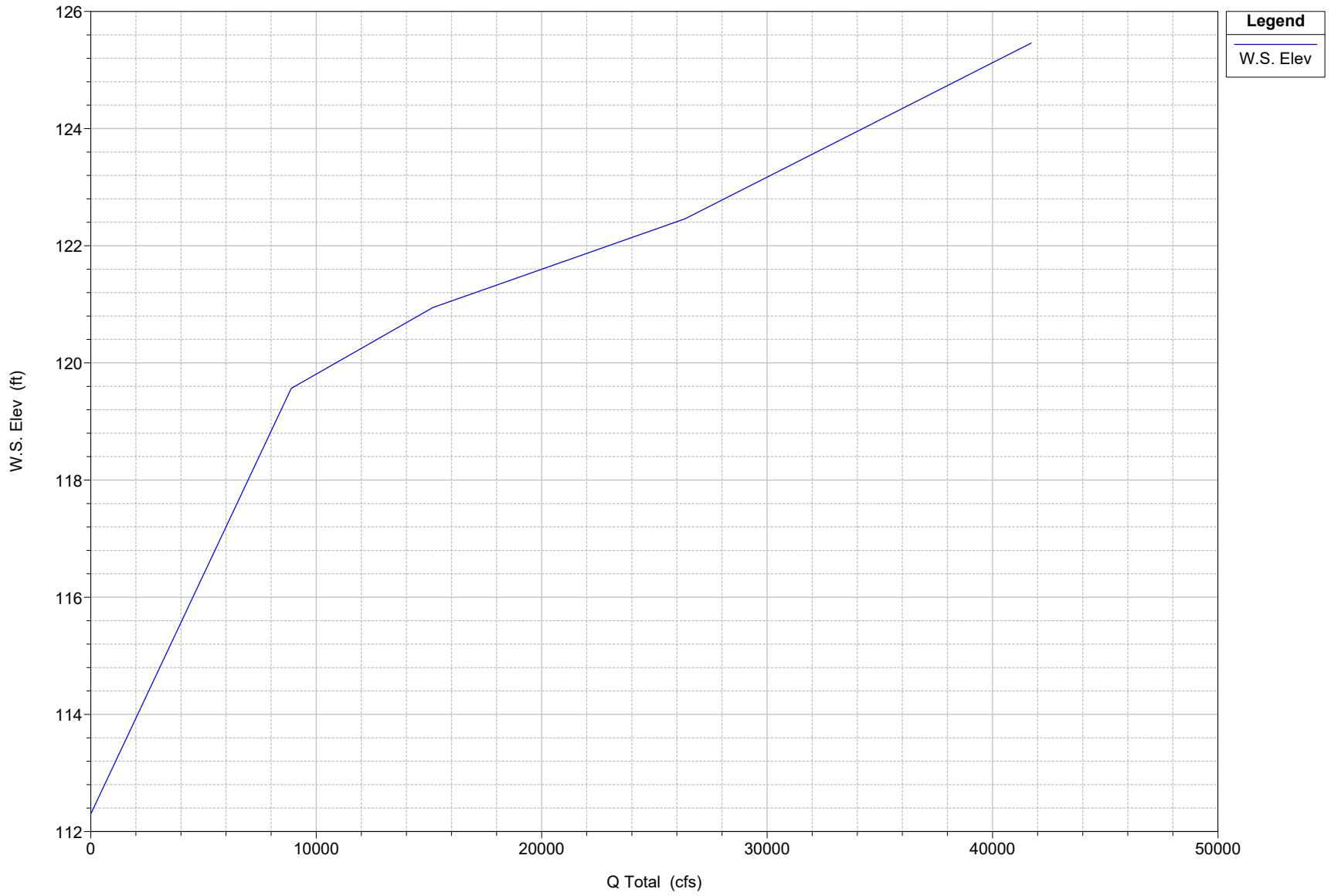
Patuxent River Plan: Plan 04 6/5/2019  
RS = 195583.1



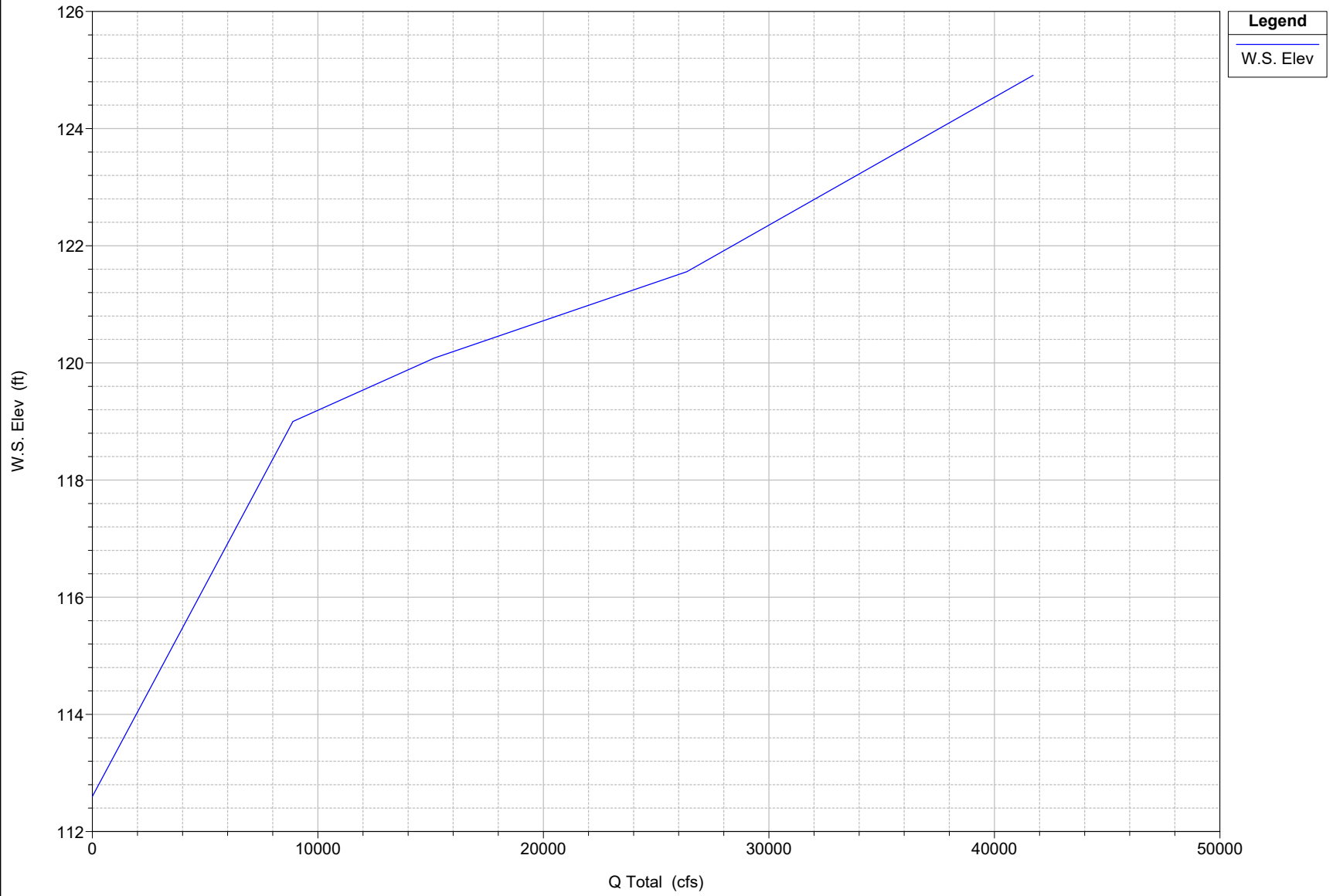
Patuxent River Plan: Plan 04 6/5/2019  
RS = 194817.8



Patuxent River Plan: Plan 04 6/5/2019  
RS = 193854.4

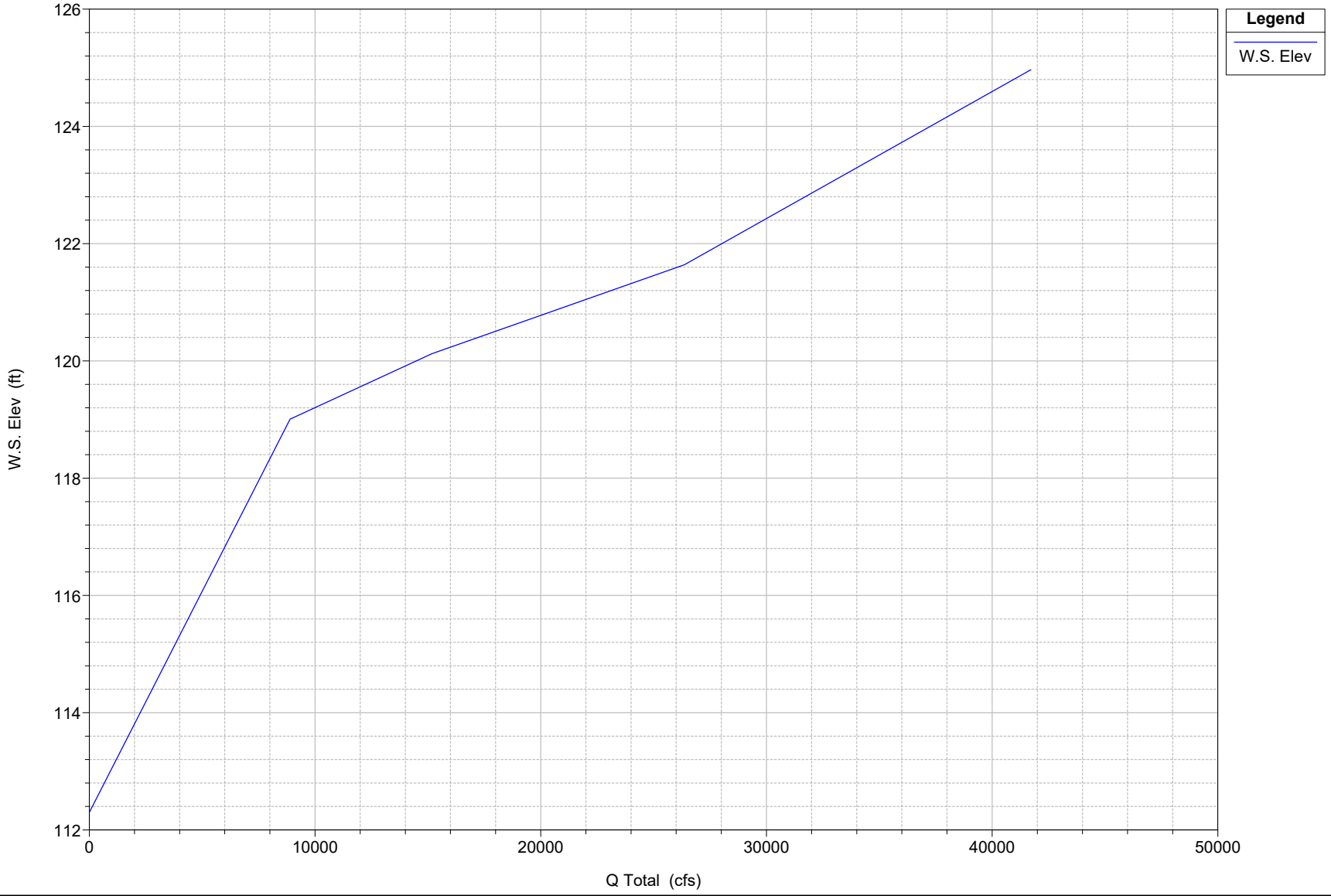


Patuxent River Plan: Plan 04 6/5/2019  
RS = 193357.9

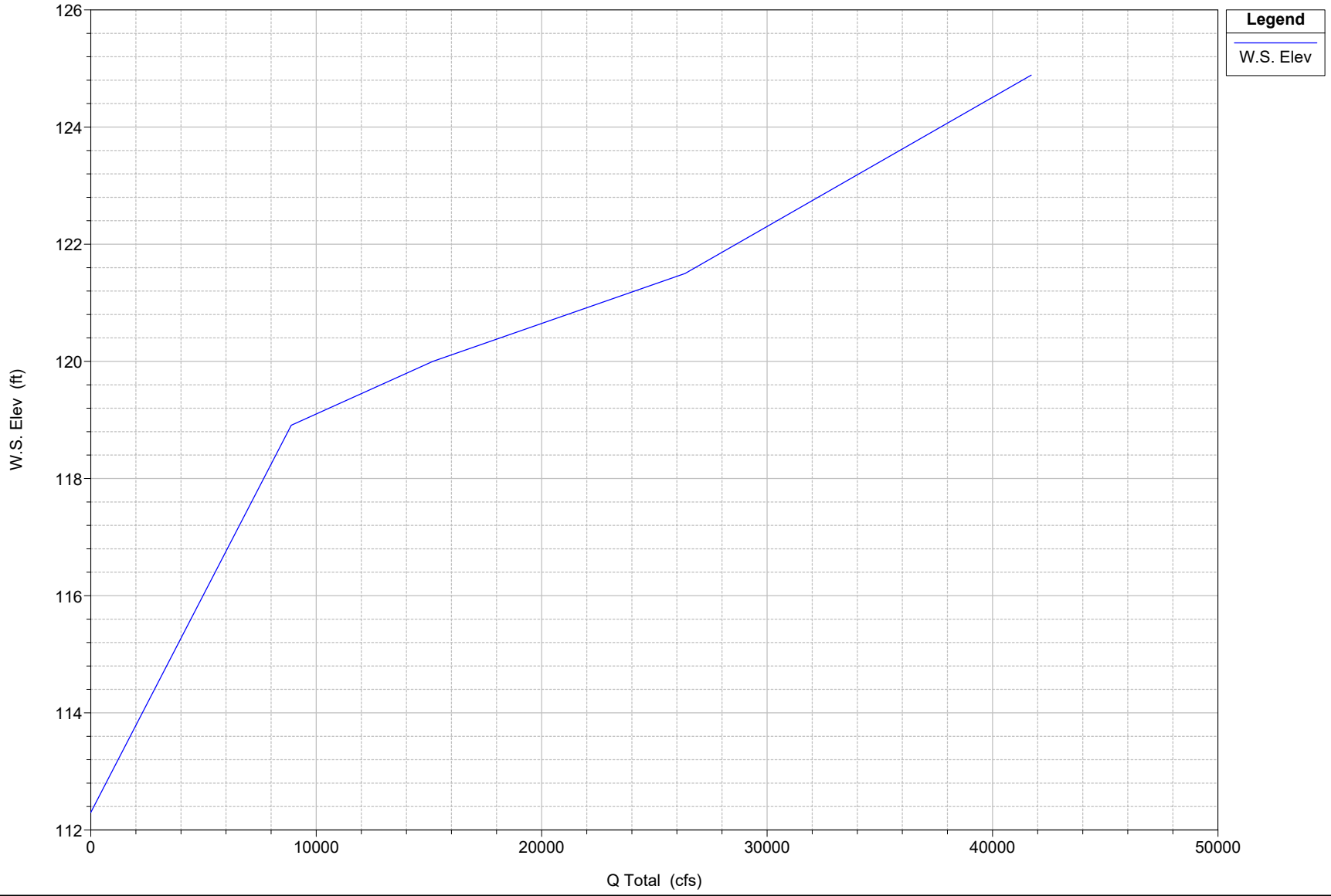


Patuxent River Plan: Plan 04 6/5/2019

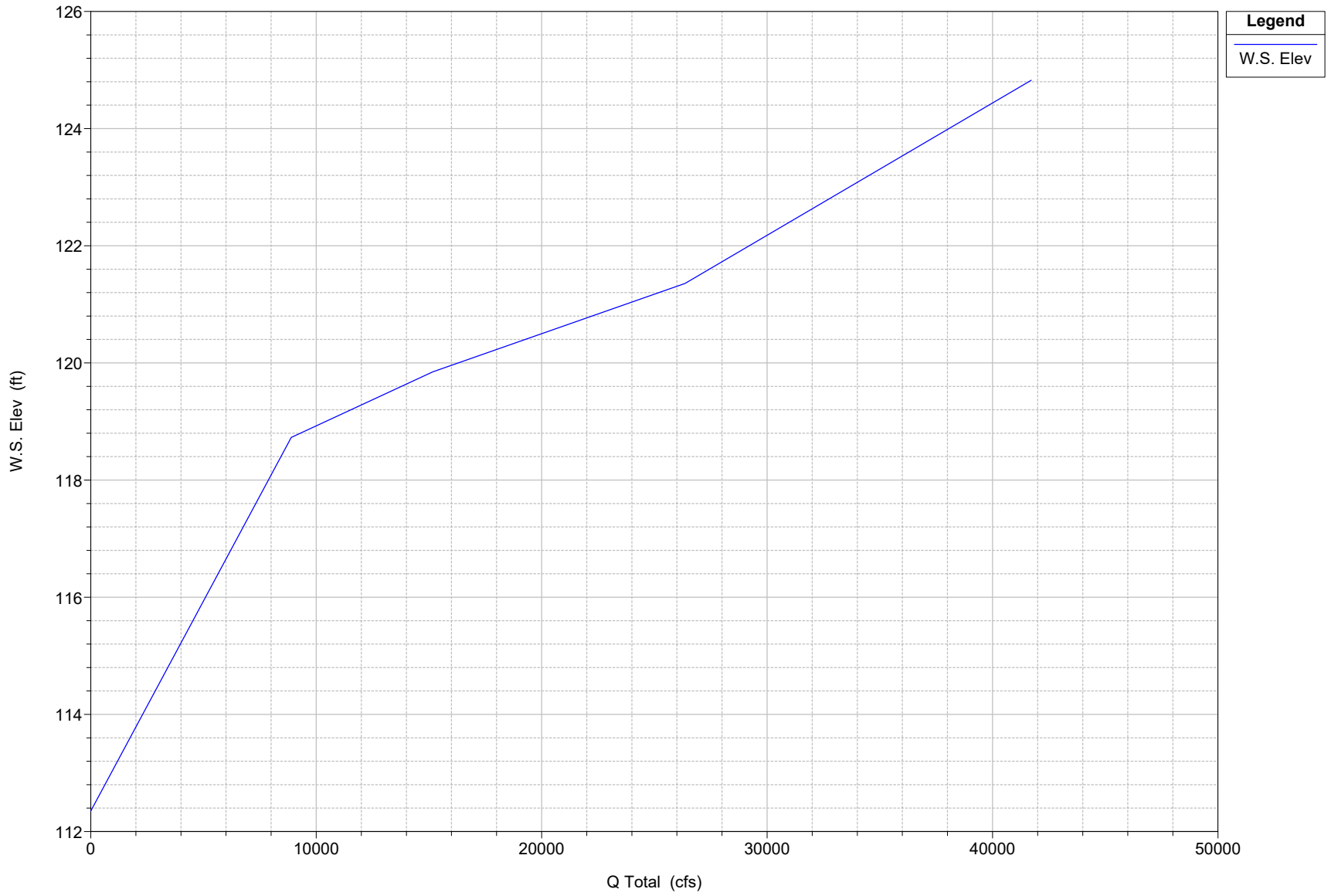
RS = 193176.6



Patuxent River Plan: Plan 04 6/5/2019  
RS = 192867

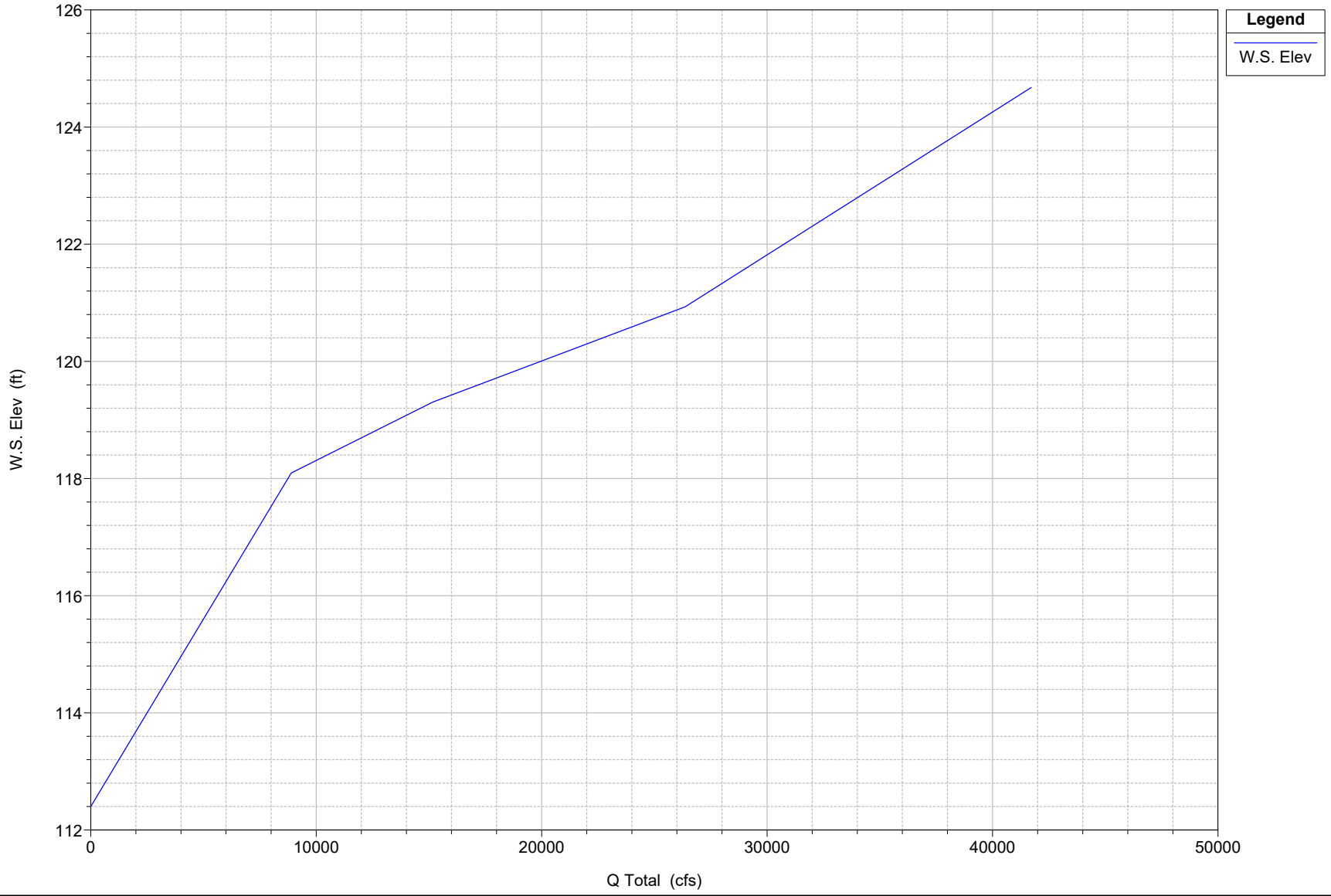


Patuxent River Plan: Plan 04 6/5/2019  
RS = 192774.7



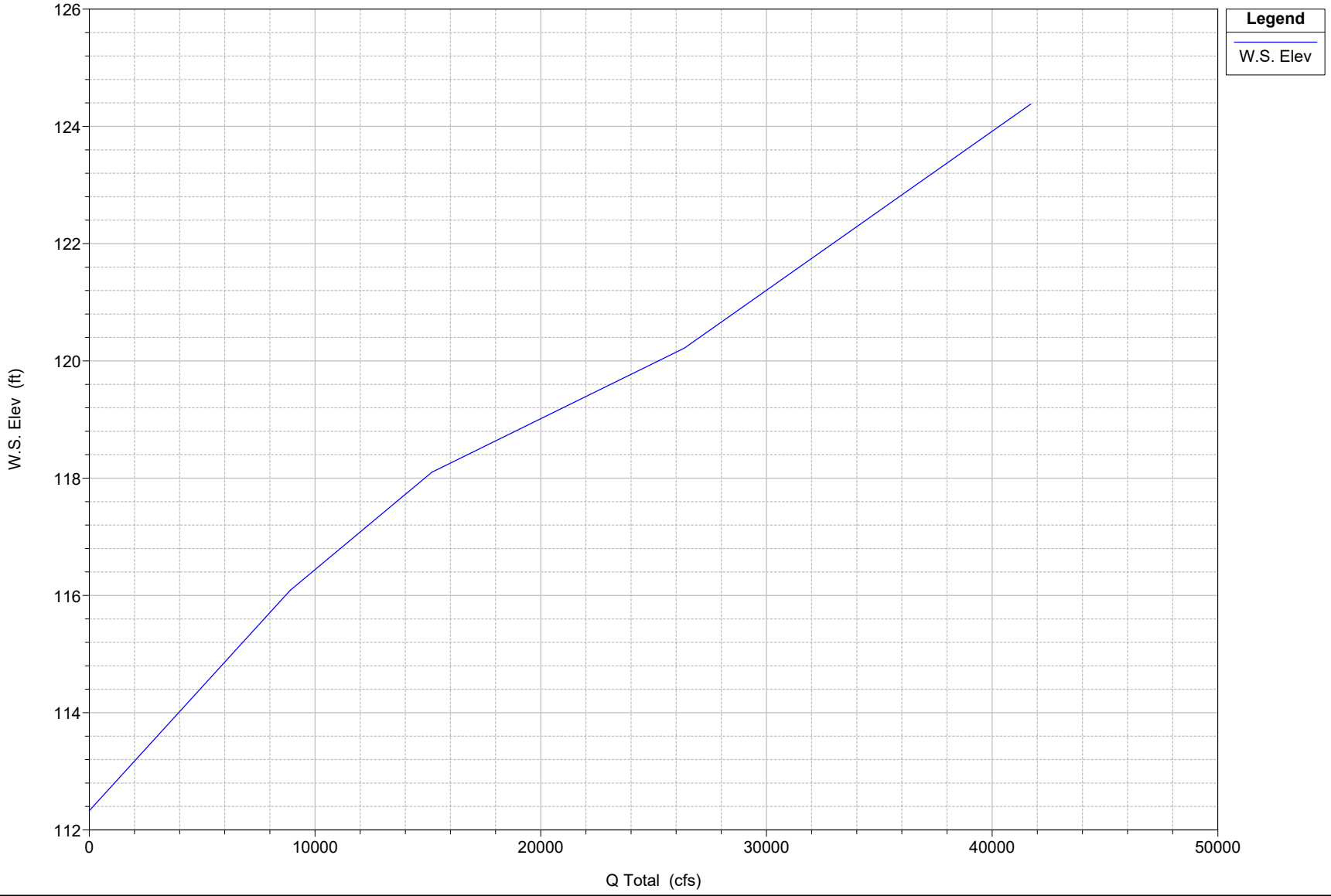


Patuxent River Plan: Plan 04 6/5/2019  
RS = 192514.9

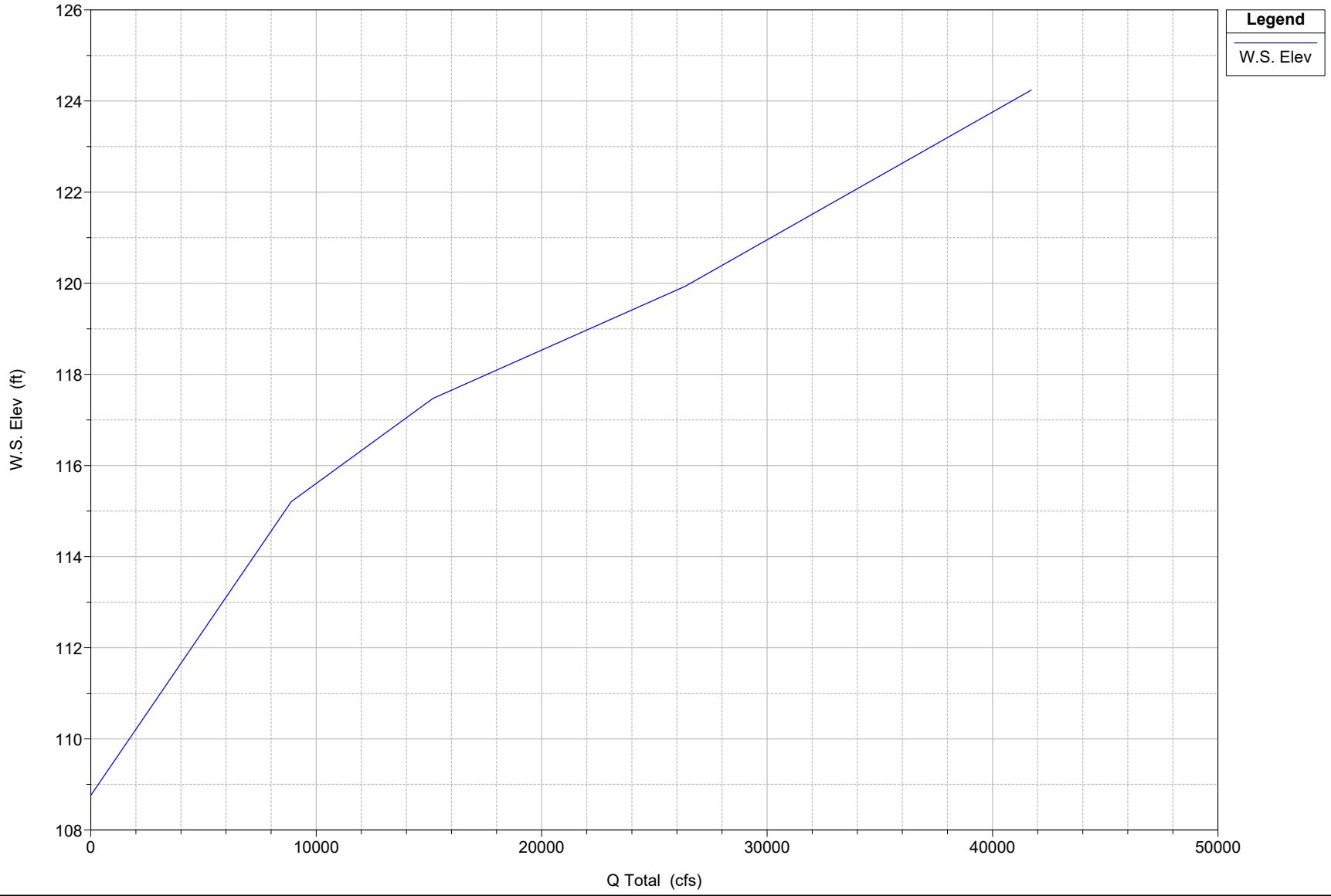


Patuxent River Plan: Plan 04 6/5/2019

RS = 191681.5



Patuxent River Plan: Plan 04 6/5/2019  
RS = 190879.0



## **Appendix G**

### **Existing Stream Channel Data**

# EXISTING STREAM CHANNEL INFORMATION

PatuxentRiver.rep

HEC-RAS Version 4.1.0 Jan 2010  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```
X      X  XXXXXX   XXXX       XXXX       XX       XXXX
X      X  X       X   X       X  X       X  X       X
X      X  X       X       X  X       X  X       X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X       X  X       X  X       X
X      X  X       X   X       X  X       X  X       X
X      X  XXXXXX   XXXX       X  X       X  X       XXXXX
```

## PROJECT DATA

Project Title: Patuxent River  
Project File : PatuxentRiver.prj  
Run Date and Time: 5/23/2019 2:59:53 PM

Project in English units

## Project Description:

Patuxent River - Anne Arundel County (Including the Laurel model) - Detailed Method

Vertical Datum: North American Vertical Datum 88 (NAVD88)

Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet

Geographic Coordinate System: North American 1983 Datum: North American 1983

Created by: Prince Georges County, MD in cooperation with USACE - Buffalo District as part of FEMA Map Modernization study for Anne Arundel County

GeoRAS Version: 4.2.92

ArcGIS Version: 9.2

## Reach Boundary

Conditions: Known WS Elevations from the 1985 FIS Report for Anne Arundel County.

PatuxentRiver.rep

4.12				
Conv. Total (cfs)	2154949.0	Conv. (cfs)	1399207.0	547510.4
208231.5				
Length Wtd. (ft)	74.00	Wetted Per. (ft)	2846.25	140.55
1598.73				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.21	0.32
0.10				
Alpha	5.69	Stream Power (lb/ft s)	5332.68	0.00
0.00				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	34809.30	13715.87
49574.79				
C & E Loss (ft)	0.26	Cum SA (acres)	3708.86	715.71
4962.27				

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 201119

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	133.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.53	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	131.64	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	131.64	Flow Area (sq ft)	478.21	655.35
232.29				
E.G. Slope (ft/ft)	0.006059	Area (sq ft)	4182.05	655.35
747.25				
Q Total (cfs)	8324.00	Flow (cfs)	809.71	7052.29
462.00				
Top Width (ft)	2291.19	Top Width (ft)	1767.59	137.00

PatuxentRiver.rep

386.60				
Vel Total (ft/s)	6.09	Avg. Vel. (ft/s)	1.69	10.76
1.99				
Max Chl Dpth (ft)	9.69	Hydr. Depth (ft)	1.77	4.78
2.26				
Conv. Total (cfs)	106934.9	Conv. (cfs)	10402.0	90597.8
5935.1				
Length Wtd. (ft)	61.35	Wetted Per. (ft)	270.00	140.55
103.02				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.67	1.76
0.85				
Alpha	2.65	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	10289.32	7831.23
16038.22				
C & E Loss (ft)	0.29	Cum SA (acres)	2454.26	703.35
3463.86				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	135.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	134.91	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	133.19	Flow Area (sq ft)	10040.63	1103.17
750.21				
E.G. Slope (ft/ft)	0.000469	Area (sq ft)	10040.63	1103.17
2045.57				
Q Total (cfs)	15174.00	Flow (cfs)	10137.01	4672.52
364.47				

PatuxentRiver.rep				
Top Width (ft)	2369.27	Top Width (ft)	1828.90	137.00
403.37				
Vel Total (ft/s)	1.28	Avg. Vel. (ft/s)	1.01	4.24
0.49				
Max Chl Dpth (ft)	12.96	Hydr. Depth (ft)	5.49	8.05
1.86				
Conv. Total (cfs)	700834.6	Conv. (cfs)	468193.4	215807.7
16833.4				
Length Wtd. (ft)	58.62	Wetted Per. (ft)	1829.80	140.55
404.29				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.16	0.23
0.05				
Alpha	3.82	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	18490.51	10360.15
26946.18				
C & E Loss (ft)	0.41	Cum SA (acres)	2977.46	713.20
3937.82				

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	134.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.39	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	134.30	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.30	Flow Area (sq ft)	8938.68	1020.24
506.63				
E.G. Slope (ft/ft)	0.002014	Area (sq ft)	8938.68	1020.24
1801.98				
Q Total (cfs)	26267.00	Flow (cfs)	17370.37	8502.58



PatuxentRiver.rep

394.05				
Top Width (ft)	2350.12	Top Width (ft)	1811.73	137.00
401.39				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.94	8.33
0.78				
Max Chl Dpth (ft)	12.35	Hydr. Depth (ft)	4.93	7.45
1.26				
Conv. Total (cfs)	585270.5	Conv. (cfs)	387039.3	189451.0
8780.1				
Length Wtd. (ft)	57.42	Wetted Per. (ft)	1812.52	140.55
402.22				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.62	0.91
0.16				
Alpha	3.97	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	24058.88	11550.00
35509.55				
C & E Loss (ft)	0.10	Cum SA (acres)	3304.54	712.92
4351.17				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	136.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	135.52	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.31	Flow Area (sq ft)	11179.76	1187.79
999.97				
E.G. Slope (ft/ft)	0.002583	Area (sq ft)	11179.76	1187.79
2295.32				
Q Total (cfs)	41717.00	Flow (cfs)	27936.03	12404.74
1376.24				
Top Width (ft)	2398.69	Top Width (ft)	1856.29	137.00

PatuxentRiver.rep

405.40				
Vel Total (ft/s)	3.12	Avg. Vel. (ft/s)	2.50	10.44
1.38				
Max Chl Dpth (ft)	13.57	Hydr. Depth (ft)	6.02	8.67
2.47				
Conv. Total (cfs)	820887.4	Conv. (cfs)	549712.0	244094.6
27080.9				
Length Wtd. (ft)	59.01	Wetted Per. (ft)	1857.25	140.55
406.41				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.97	1.36
0.40				
Alpha	3.77	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	34770.10	13705.42
49551.45				
C & E Loss (ft)	0.15	Cum SA (acres)	3703.99	714.79
4958.92				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1

RS: 201058.7

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	132.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.56	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	130.88	Flow Area (sq ft)	1616.46	476.42
33.19				
E.G. Slope (ft/ft)	0.004020	Area (sq ft)	6619.73	476.42
671.24				
Q Total (cfs)	8324.00	Flow (cfs)	3454.62	4823.01
46.37				
Top Width (ft)	2057.15	Top Width (ft)	1750.17	60.00
246.99				
Vel Total (ft/s)	3.92	Avg. Vel. (ft/s)	2.14	10.12
1.40				
Max Chl Dpth (ft)	8.60	Hydr. Depth (ft)	3.42	7.94
1.84				

PatuxentRiver.rep

Conv. Total (cfs) 731.3	131279.3	Conv. (cfs)	54483.5	76064.5
Length Wtd. (ft) 18.38	688.26	Wetted Per. (ft)	473.16	65.33
Min Ch El (ft) 0.45	122.96	Shear (lb/sq ft)	0.86	1.83
Alpha 0.00	4.00	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 16035.97	2.12	Cum Volume (acre-ft)	10282.48	7830.44
C & E Loss (ft) 3462.86	0.22	Cum SA (acres)	2452.03	703.22

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	134.52	Element	Left OB	Channel
Vel Head (ft) 0.100	1.47	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	133.06	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 65.01	132.41	Flow Area (sq ft)	2324.85	566.28
E.G. Slope (ft/ft) 1346.81	0.005581	Area (sq ft)	9308.01	566.28
Q Total (cfs) 136.37	15174.00	Flow (cfs)	7458.79	7578.84
Top Width (ft) 581.95	2479.30	Top Width (ft)	1837.35	60.00
Vel Total (ft/s) 2.10	5.13	Avg. Vel. (ft/s)	3.21	13.38
Max Chl Dpth (ft) 2.65	10.10	Hydr. Depth (ft)	4.92	9.44
Conv. Total (cfs) 1825.4	203118.1	Conv. (cfs)	99842.9	101449.8
Length Wtd. (ft)	665.55	Wetted Per. (ft)	473.16	65.33

PatuxentRiver.rep

25.03 Min Ch El (ft) 0.91 Alpha 0.00	122.96	Shear (lb/sq ft)	1.71	3.02
Frctn Loss (ft) 26940.78	2.77	Cum Volume (acre-ft)	18478.25	10359.00
C & E Loss (ft) 3936.25	0.34	Cum SA (acres)	2975.14	713.07

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	134.35	Element	Left OB	Channel
Vel Head (ft) 0.100	0.19	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	134.15	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 365.78	133.70	Flow Area (sq ft)	11346.88	632.18
E.G. Slope (ft/ft) 2020.67	0.001460	Area (sq ft)	11346.88	632.18
Q Total (cfs) 204.61	26267.00	Flow (cfs)	21405.23	4657.15
Top Width (ft) 645.96	2578.54	Top Width (ft)	1872.58	60.00
Vel Total (ft/s) 0.56	2.13	Avg. Vel. (ft/s)	1.89	7.37
Max Chl Dpth (ft) 0.57	11.19	Hydr. Depth (ft)	6.06	10.54
Conv. Total (cfs) 5354.9	687427.9	Conv. (cfs)	560191.7	121881.3
Length Wtd. (ft) 650.52	580.02	Wetted Per. (ft)	1873.61	65.33
Min Ch El (ft) 0.05	122.96	Shear (lb/sq ft)	0.55	0.88

PatuxentRiver.rep				
Alpha 0.00	2.77	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 35503.47	1.08	Cum Volume (acre-ft)	24046.03	11548.86
C & E Loss (ft) 4349.50	0.01	Cum SA (acres)	3302.21	712.79

Warning: Divided flow computed for this cross-section.  
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	135.82	Element	Left OB	Channel
Vel Head (ft) 0.100	0.27	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	135.54	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 1367.24	133.70	Flow Area (sq ft)	13965.29	715.50
E.G. Slope (ft/ft) 3030.92	0.001869	Area (sq ft)	13965.29	715.50
Q Total (cfs) 1289.68	41717.00	Flow (cfs)	33950.96	6476.36
Top Width (ft) 873.65	2829.33	Top Width (ft)	1895.68	60.00
Vel Total (ft/s) 0.94	2.60	Avg. Vel. (ft/s)	2.43	9.05
Max Chl Dpth (ft) 1.56	12.58	Hydr. Depth (ft)	7.37	11.92
Conv. Total (cfs) 29833.2	965009.0	Conv. (cfs)	785362.8	149813.0
Length Wtd. (ft) 880.57	558.44	Wetted Per. (ft)	1896.76	65.33
Min Ch El (ft) 0.18	122.96	Shear (lb/sq ft)	0.86	1.28
Alpha 0.00	2.60	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 49542.99	1.27	Cum Volume (acre-ft)	34754.17	13704.11
C & E Loss (ft) 4956.88	0.01	Cum SA (acres)	3701.61	714.65

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 200115.4

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	130.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.22	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	129.95	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3577.64	352.87
101.69				
E.G. Slope (ft/ft)	0.002460	Area (sq ft)	4398.99	352.87
4924.93				
Q Total (cfs)	8893.00	Flow (cfs)	6431.11	2361.21
100.68				
Top Width (ft)	2693.93	Top Width (ft)	1306.28	57.00
1330.65				
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.69
0.99				
Max Chl Dpth (ft)	14.53	Hydr. Depth (ft)	3.81	6.19
1.56				
Conv. Total (cfs)	179299.5	Conv. (cfs)	129663.3	47606.4
2029.8				
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29
65.32				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.59	0.87
0.24				
Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	2.99	Cum Volume (acre-ft)	10218.15	7821.47
16016.29				
C & E Loss (ft)	0.04	Cum SA (acres)	2434.19	701.95
3457.31				

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	131.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.07	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	129.18	Flow Area (sq ft)	4629.81	416.74
177.66				
E.G. Slope (ft/ft)	0.003231	Area (sq ft)	5913.60	416.74
6454.84				
Q Total (cfs)	15174.00	Flow (cfs)	11326.60	3570.69
276.71				
Top Width (ft)	2864.22	Top Width (ft)	1412.91	57.00
1394.31				
Vel Total (ft/s)	2.90	Avg. Vel. (ft/s)	2.45	8.57
1.56				
Max Chl Dpth (ft)	15.65	Hydr. Depth (ft)	4.93	7.31
2.52				
Conv. Total (cfs)	266949.9	Conv. (cfs)	199264.2	62817.7
4868.0				
Length Wtd. (ft)	1518.83	Wetted Per. (ft)	939.20	62.29
70.95				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.99	1.35
0.51				
Alpha	2.58	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	2.81	Cum Volume (acre-ft)	18389.39	10348.36
26913.36				
C & E Loss (ft)	0.08	Cum SA (acres)	2956.17	711.80
3929.30				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

PatuxentRiver.rep

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	133.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	132.99	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	130.23	Flow Area (sq ft)	8793.93	525.98
1417.50				
E.G. Slope (ft/ft)	0.002447	Area (sq ft)	8793.93	525.98
9702.33				
Q Total (cfs)	26361.00	Flow (cfs)	20718.98	4580.50
1061.52				
Top Width (ft)	3735.36	Top Width (ft)	1531.63	57.00
2146.73				
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	2.36	8.71
0.75				
Max Chl Dpth (ft)	17.57	Hydr. Depth (ft)	5.74	9.23
0.66				
Conv. Total (cfs)	532890.5	Conv. (cfs)	418836.4	92595.3
21458.8				
Length Wtd. (ft)	1517.63	Wetted Per. (ft)	1532.44	62.29
2158.09				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.88	1.29
0.10				
Alpha	2.91	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.11	Cum Volume (acre-ft)	23928.45	11536.32
35462.26				
C & E Loss (ft)	0.04	Cum SA (acres)	3282.34	711.52
4339.68				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth



with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	134.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.21	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	131.43	Flow Area (sq ft)	10672.44	595.62
4295.06				
E.G. Slope (ft/ft)	0.002826	Area (sq ft)	10672.44	595.62
12595.15				
Q Total (cfs)	41717.00	Flow (cfs)	30582.17	6055.33
5079.50				
Top Width (ft)	4085.29	Top Width (ft)	1543.59	57.00
2484.70				
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)	2.87	10.17
1.18				
Max Chl Dpth (ft)	18.79	Hydr. Depth (ft)	6.91	10.45
1.73				
Conv. Total (cfs)	784803.1	Conv. (cfs)	575328.5	113916.2
95558.4				
Length Wtd. (ft)	1519.35	Wetted Per. (ft)	1544.47	62.29
2498.45				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	1.22	1.69
0.30				
Alpha	2.95	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.32	Cum Volume (acre-ft)	34610.34	13689.91
49488.05				
C & E Loss (ft)	0.06	Cum SA (acres)	3681.54	713.39
4945.08				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

PatuxentRiver.rep

RIVER: Patuxent River  
 REACH: 1

RS: 198588.0

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	127.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	127.05	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	1532.69	288.39
4244.69				
E.G. Slope (ft/ft)	0.001608	Area (sq ft)	1532.69	288.39
11766.61				
Q Total (cfs)	8893.00	Flow (cfs)	1560.28	1521.57
5811.16				
Top Width (ft)	4718.14	Top Width (ft)	686.01	50.00
3982.14				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	1.02	5.28
1.37				
Max Chl Dpth (ft)	11.13	Hydr. Depth (ft)	2.23	5.77
2.21				
Conv. Total (cfs)	221800.3	Conv. (cfs)	38914.8	37949.5
144936.0				
Length Wtd. (ft)	950.12	Wetted Per. (ft)	686.21	52.85
1921.65				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.22	0.55
0.22				
Alpha	2.87	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	10115.93	7810.22
15721.70				
C & E Loss (ft)	0.01	Cum SA (acres)	2399.85	700.07
3363.54				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

PatuxentRiver.rep				
E.G. Elev (ft)	128.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	128.44	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	2518.75	357.79
6975.27				
E.G. Slope (ft/ft)	0.001200	Area (sq ft)	2518.75	357.79
17377.50				
Q Total (cfs)	15174.00	Flow (cfs)	2889.88	1882.73
10401.40				
Top Width (ft)	4883.34	Top Width (ft)	756.44	50.00
4076.90				
Vel Total (ft/s)	1.54	Avg. Vel. (ft/s)	1.15	5.26
1.49				
Max Chl Dpth (ft)	12.52	Hydr. Depth (ft)	3.33	7.16
3.53				
Conv. Total (cfs)	438117.1	Conv. (cfs)	83439.0	54359.8
300318.3				
Length Wtd. (ft)	949.14	Wetted Per. (ft)	756.66	52.85
1976.46				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.25	0.51
0.26				
Alpha	2.20	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.22	Cum Volume (acre-ft)	18244.07	10334.78
26492.73				
C & E Loss (ft)	0.00	Cum SA (acres)	2918.78	709.92
3832.74				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	130.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	129.98	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	3753.98	434.99

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11275.65				
E.G. Slope (ft/ft)	0.001737	Area (sq ft)	3753.98	434.99
23725.37				
Q Total (cfs)	26361.00	Flow (cfs)	6233.47	3137.80
16989.73				
Top Width (ft)	5049.93	Top Width (ft)	854.85	50.00
4145.08				
Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	1.66	7.21
1.51				
Max Chl Dpth (ft)	14.06	Hydr. Depth (ft)	4.39	8.70
2.72				
Conv. Total (cfs)	632464.6	Conv. (cfs)	149556.2	75283.4
407625.1				
Length Wtd. (ft)	949.28	Wetted Per. (ft)	855.10	52.85
4152.60				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.48	0.89
0.29				
Alpha	2.86	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	23712.20	11519.47
34872.29				
C & E Loss (ft)	0.02	Cum SA (acres)	3241.21	709.64
4228.64				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	131.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	131.03	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	4658.37	487.09
15605.92				
E.G. Slope (ft/ft)	0.001744	Area (sq ft)	4658.37	487.09
28055.64				
Q Total (cfs)	41717.00	Flow (cfs)	8746.05	3795.94
29175.01				

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Top Width (ft) 4162.77	5097.55	Top Width (ft)	884.78	50.00
Vel Total (ft/s) 1.87	2.01	Avg. Vel. (ft/s)	1.88	7.79
Max Chl Dpth (ft) 3.75	15.11	Hydr. Depth (ft)	5.26	9.74
Conv. Total (cfs) 698672.5	999023.6	Conv. (cfs)	209447.2	90903.9
Length Wtd. (ft) 4170.33	947.74	Wetted Per. (ft)	885.05	52.85
Min Ch El (ft) 0.41	119.57	Shear (lb/sq ft)	0.57	1.00
Alpha 0.00	2.16	Stream Power (lb/ft s)	5710.31	0.00
Frctn Loss (ft) 48770.60	1.21	Cum Volume (acre-ft)	34346.13	13670.93
C & E Loss (ft) 4827.75	0.02	Cum SA (acres)	3639.69	711.51

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
REACH: 1 RS: 197599.6

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	125.86	Element	Left OB	Channel
Vel Head (ft) 0.080	0.06	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 1005.50	125.80	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 6321.29	124.38	Flow Area (sq ft)	71.79	229.04
E.G. Slope (ft/ft) 11163.05	0.001141	Area (sq ft)	71.79	229.04
Q Total (cfs) 7782.42	8893.00	Flow (cfs)	56.55	1054.03
Top Width (ft)	3567.93	Top Width (ft)	35.89	36.93

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3495.10				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	0.79	4.60
1.23				
Max Chl Dpth (ft)	10.18	Hydr. Depth (ft)	2.00	6.20
2.75				
Conv. Total (cfs)	263288.3	Conv. (cfs)	1674.3	31205.9
230408.1				
Length Wtd. (ft)	1010.19	Wetted Per. (ft)	36.52	39.84
2299.46				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.14	0.41
0.20				
Alpha	2.13	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	10097.63	7804.35
15474.89				
C & E Loss (ft)	0.01	Cum SA (acres)	2391.62	699.09
3283.06				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	127.30	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	127.22	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	124.84	Flow Area (sq ft)	141.73	281.51
9727.97				
E.G. Slope (ft/ft)	0.001376	Area (sq ft)	141.73	281.51
16127.68				
Q Total (cfs)	15174.00	Flow (cfs)	139.05	1630.07
13404.88				
Top Width (ft)	3601.38	Top Width (ft)	58.99	37.00
3505.39				
Vel Total (ft/s)	1.49	Avg. Vel. (ft/s)	0.98	5.79
1.38				
Max Chl Dpth (ft)	11.60	Hydr. Depth (ft)	2.40	7.61
2.78				

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Conv. Total (cfs) 361350.7	409040.3	Conv. (cfs)	3748.3	43941.4
Length Wtd. (ft) 3509.43	1008.78	Wetted Per. (ft)	59.69	39.93
Min Ch El (ft) 0.24	117.91	Shear (lb/sq ft)	0.20	0.61
Alpha 4505.90	2.37	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 26132.09	0.99	Cum Volume (acre-ft)	18213.73	10327.52
C & E Loss (ft) 3751.13	0.00	Cum SA (acres)	2909.48	708.94

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	129.08	Element	Left OB	Channel
Vel Head (ft) 0.076	0.05	Wt. n-Val.	0.088	0.035
W.S. Elev (ft) 1005.50	129.03	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 17342.14	125.41	Flow Area (sq ft)	412.78	348.45
E.G. Slope (ft/ft) 27411.61	0.000716	Area (sq ft)	412.78	348.45
Q Total (cfs) 24343.84	26361.00	Flow (cfs)	339.80	1677.36
Top Width (ft) 4184.97	4520.98	Top Width (ft)	299.02	37.00
Vel Total (ft/s) 1.40	1.46	Avg. Vel. (ft/s)	0.82	4.81
Max Chl Dpth (ft) 4.14	13.41	Hydr. Depth (ft)	1.38	9.42
Conv. Total (cfs) 910044.8	985452.2	Conv. (cfs)	12702.8	62704.6
Length Wtd. (ft) 4189.91	1007.94	Wetted Per. (ft)	300.02	39.93
Min Ch El (ft) 0.18	117.91	Shear (lb/sq ft)	0.06	0.39
Alpha 4505.90	1.56	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	23664.69	11510.58

PatuxentRiver.rep

34321.86  
 C & E Loss (ft) 0.01 Cum SA (acres) 3228.05 708.66  
 4138.98

Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	129.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.077	0.035
0.075				
W.S. Elev (ft)	129.85	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	126.00	Flow Area (sq ft)	708.96	378.84
20797.35				
E.G. Slope (ft/ft)	0.000979	Area (sq ft)	708.96	378.84
30866.81				
Q Total (cfs)	41717.00	Flow (cfs)	767.64	2255.64
38693.72				
Top Width (ft)	4691.78	Top Width (ft)	434.38	37.00
4220.40				
Vel Total (ft/s)	1.91	Avg. Vel. (ft/s)	1.08	5.95
1.86				
Max Chl Dpth (ft)	14.23	Hydr. Depth (ft)	1.63	10.24
4.93				
Conv. Total (cfs)	1333093.0	Conv. (cfs)	24530.5	72080.3
1236482.0				
Length Wtd. (ft)	1007.76	Wetted Per. (ft)	435.52	39.93
4225.47				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.10	0.58
0.30				
Alpha	1.42	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	1.37	Cum Volume (acre-ft)	34284.93	13661.11
48136.38				
C & E Loss (ft)	0.02	Cum SA (acres)	3624.65	710.52
4737.52				

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream



conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196568.8

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.43	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	123.63	Flow Area (sq ft)	158.09	398.57
5394.89				
E.G. Slope (ft/ft)	0.001419	Area (sq ft)	158.09	398.57
7376.87				
Q Total (cfs)	8893.00	Flow (cfs)	111.88	2280.30
6500.83				
Top Width (ft)	3409.19	Top Width (ft)	111.12	56.00
3242.07				
Vel Total (ft/s)	1.49	Avg. Vel. (ft/s)	0.71	5.72
1.20				
Max Chl Dpth (ft)	10.43	Hydr. Depth (ft)	1.42	7.12
2.26				
Conv. Total (cfs)	236079.4	Conv. (cfs)	2969.9	60534.3
172575.1				
Length Wtd. (ft)	210.48	Wetted Per. (ft)	111.21	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.13	0.60
0.20				
Alpha	4.24	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	10094.99	7796.93
15260.91				
C & E Loss (ft)	0.02	Cum SA (acres)	2389.93	697.99
3205.30				

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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	126.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	126.23	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	124.12	Flow Area (sq ft)	362.85	499.61
9699.86				
E.G. Slope (ft/ft)	0.000738	Area (sq ft)	362.85	499.61
13230.85				
Q Total (cfs)	15174.00	Flow (cfs)	312.80	2396.64
12464.56				
Top Width (ft)	3418.85	Top Width (ft)	115.85	56.00
3246.99				
Vel Total (ft/s)	1.44	Avg. Vel. (ft/s)	0.86	4.80
1.29				
Max Chl Dpth (ft)	12.23	Hydr. Depth (ft)	3.13	8.92
4.07				
Conv. Total (cfs)	558520.3	Conv. (cfs)	11513.4	88215.0
458792.0				
Length Wtd. (ft)	210.29	Wetted Per. (ft)	116.28	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.14	0.39
0.19				
Alpha	2.43	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	18207.94	10318.28
25793.25				
C & E Loss (ft)	0.01	Cum SA (acres)	2907.47	707.84
3673.19				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	128.28	Element	Left OB	Channel
Vel Head (ft) 0.080	0.11	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 210.00	128.17	Reach Len. (ft)	208.00	212.00
Crit W.S. (ft) 14632.49	124.75	Flow Area (sq ft)	592.88	608.40
E.G. Slope (ft/ft) 22892.15	0.000876	Area (sq ft)	592.88	608.40
Q Total (cfs) 21986.14	26361.00	Flow (cfs)	749.14	3625.71
Top Width (ft) 4110.68	4287.64	Top Width (ft)	120.95	56.00
Vel Total (ft/s) 1.50	1.66	Avg. Vel. (ft/s)	1.26	5.96
Max Chl Dpth (ft) 3.56	14.17	Hydr. Depth (ft)	4.90	10.86
Conv. Total (cfs) 742839.2	890651.1	Conv. (cfs)	25311.1	122500.8
Length Wtd. (ft) 4118.26	210.20	Wetted Per. (ft)	121.74	58.91
Min Ch El (ft) 0.19	115.84	Shear (lb/sq ft)	0.27	0.56
Alpha 3660.00	2.46	Stream Power (lb/ft s)	4607.00	0.00
Frctn Loss (ft) 33741.28	0.10	Cum Volume (acre-ft)	23653.14	11499.26
C & E Loss (ft) 4043.23	0.02	Cum SA (acres)	3223.23	707.56

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	128.54	Element	Left OB	Channel
Vel Head (ft)	0.24	Wt. n-Val.	0.100	0.035

PatuxentRiver.rep

0.080				
W.S. Elev (ft)	128.30	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	125.41	Flow Area (sq ft)	608.34	615.56
15157.95				
E.G. Slope (ft/ft)	0.002008	Area (sq ft)	608.34	615.56
23417.61				
Q Total (cfs)	41717.00	Flow (cfs)	1181.50	5596.66
34938.84				
Top Width (ft)	4295.12	Top Width (ft)	121.29	56.00
4117.84				
Vel Total (ft/s)	2.55	Avg. Vel. (ft/s)	1.94	9.09
2.30				
Max Chl Dpth (ft)	14.30	Hydr. Depth (ft)	5.02	10.99
3.68				
Conv. Total (cfs)	931070.8	Conv. (cfs)	26369.6	124910.3
779790.9				
Length Wtd. (ft)	210.20	Wetted Per. (ft)	122.10	58.91
4125.42				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.62	1.31
0.46				
Alpha	2.41	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	34269.80	13649.34
47509.85				
C & E Loss (ft)	0.05	Cum SA (acres)	3618.27	709.42
4641.28				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196356.8

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.36	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep				
Vel Head (ft) 0.080	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	124.29	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 6962.69	122.64	Flow Area (sq ft)	143.37	540.57
E.G. Slope (ft/ft) 9617.62	0.000646	Area (sq ft)	143.37	540.57
Q Total (cfs) 6668.94	8893.00	Flow (cfs)	80.99	2143.07
Top Width (ft) 3136.50	3283.48	Top Width (ft)	77.98	69.00
Vel Total (ft/s) 0.96	1.16	Avg. Vel. (ft/s)	0.56	3.96
Max Chl Dpth (ft) 2.89	8.87	Hydr. Depth (ft)	1.84	7.83
Conv. Total (cfs) 262341.8	349831.5	Conv. (cfs)	3186.1	84303.7
Length Wtd. (ft) 2409.90	698.78	Wetted Per. (ft)	78.39	76.78
Min Ch El (ft) 0.12	115.42	Shear (lb/sq ft)	0.07	0.28
Alpha 3707.00	3.31	Stream Power (lb/ft s)	5128.00	0.00
Frctn Loss (ft) 15219.95	0.21	Cum Volume (acre-ft)	10094.27	7794.64
C & E Loss (ft) 3189.93	0.02	Cum SA (acres)	2389.48	697.68

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	126.18	Element	Left OB	Channel
Right OB				
Vel Head (ft) 0.079	0.05	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	126.13	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 12519.32	123.23	Flow Area (sq ft)	296.32	667.96

PatuxentRiver.rep				
E.G. Slope (ft/ft)	0.000440	Area (sq ft)	296.32	667.96
15410.63				
Q Total (cfs)	15174.00	Flow (cfs)	207.04	2516.39
12450.56				
Top Width (ft)	3297.94	Top Width (ft)	87.72	69.00
3141.22				
Vel Total (ft/s)	1.13	Avg. Vel. (ft/s)	0.70	3.77
0.99				
Max Chl Dpth (ft)	10.71	Hydr. Depth (ft)	3.38	9.68
3.99				
Conv. Total (cfs)	723309.1	Conv. (cfs)	9869.3	119950.5
593489.3				
Length Wtd. (ft)	695.69	Wetted Per. (ft)	88.30	76.78
3146.58				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.09	0.24
0.11				
Alpha	2.50	Stream Power (lb/ft s)	5128.00	0.00
3707.00				
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	18206.37	10315.44
25724.21				
C & E Loss (ft)	0.01	Cum SA (acres)	2906.99	707.53
3657.80				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	128.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	128.13	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	123.93	Flow Area (sq ft)	481.15	805.56
22563.52				
E.G. Slope (ft/ft)	0.000283	Area (sq ft)	481.15	805.56
31109.83				
Q Total (cfs)	26361.00	Flow (cfs)	348.09	2757.93
23254.98				
Top Width (ft)	4593.65	Top Width (ft)	96.96	69.00
4427.69				

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Vel Total (ft/s) 1.03	1.11	Avg. Vel. (ft/s)	0.72	3.42
Max Chl Dpth (ft) 5.10	12.71	Hydr. Depth (ft)	4.96	11.67
Conv. Total (cfs) 1382022.0	1566610.0	Conv. (cfs)	20686.5	163901.4
Length Wtd. (ft) 4434.30	693.10	Wetted Per. (ft)	97.76	76.78
Min Ch El (ft) 0.09	115.42	Shear (lb/sq ft)	0.09	0.19
Alpha 3707.00	1.78	Stream Power (lb/ft s)	5128.00	0.00
Frctn Loss (ft) 33611.11	0.16	Cum Volume (acre-ft)	23650.58	11495.82
C & E Loss (ft) 4022.65	0.00	Cum SA (acres)	3222.71	707.25

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	128.27	Element	Left OB	Channel
Vel Head (ft) 0.075	0.08	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	128.18	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 22815.99	124.56	Flow Area (sq ft)	486.68	809.49
E.G. Slope (ft/ft) 31362.31	0.000685	Area (sq ft)	486.68	809.49
Q Total (cfs) 36840.02	41717.00	Flow (cfs)	551.13	4325.86
Top Width (ft) 4432.51	4598.69	Top Width (ft)	97.18	69.00
Vel Total (ft/s) 1.61	1.73	Avg. Vel. (ft/s)	1.13	5.34
Max Chl Dpth (ft) 5.15	12.76	Hydr. Depth (ft)	5.01	11.73
Conv. Total (cfs) 1407198.0	1593487.0	Conv. (cfs)	21051.7	165237.1
Length Wtd. (ft) 4439.12	693.04	Wetted Per. (ft)	97.99	76.78
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.21	0.45

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0.22				
Alpha	1.76	Stream Power (lb/ft s)	5128.00	0.00
3707.00				
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	34267.19	13645.87
47377.80				
C & E Loss (ft)	0.00	Cum SA (acres)	3617.74	709.12
4620.67				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 195583.1

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.13	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.035
0.073				
W.S. Elev (ft)	124.11	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	120.41	Flow Area (sq ft)	2191.71	385.22
9893.16				
E.G. Slope (ft/ft)	0.000175	Area (sq ft)	2191.71	385.22
9893.16				
Q Total (cfs)	8893.00	Flow (cfs)	875.38	787.13
7230.49				
Top Width (ft)	3022.94	Top Width (ft)	756.65	50.00
2216.29				
Vel Total (ft/s)	0.71	Avg. Vel. (ft/s)	0.40	2.04
0.73				
Max Chl Dpth (ft)	10.66	Hydr. Depth (ft)	2.90	7.70
4.46				
Conv. Total (cfs)	672091.2	Conv. (cfs)	66156.8	59487.8
546446.6				
Length Wtd. (ft)	649.97	Wetted Per. (ft)	756.99	55.53
2219.94				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.03	0.08
0.05				
Alpha	1.61	Stream Power (lb/ft s)	6050.74	0.00



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3306.77				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	10073.95	7786.42
15067.91				
C & E Loss (ft)	0.00	Cum SA (acres)	2382.22	696.63
3148.21				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	126.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.074				
W.S. Elev (ft)	125.98	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	121.05	Flow Area (sq ft)	3626.96	478.57
14044.41				
E.G. Slope (ft/ft)	0.000162	Area (sq ft)	3626.96	478.57
14044.41				
Q Total (cfs)	15174.00	Flow (cfs)	1913.84	1086.64
12173.52				
Top Width (ft)	3058.59	Top Width (ft)	777.41	50.00
2231.18				
Vel Total (ft/s)	0.84	Avg. Vel. (ft/s)	0.53	2.27
0.87				
Max Chl Dpth (ft)	12.53	Hydr. Depth (ft)	4.67	9.57
6.29				
Conv. Total (cfs)	1192617.0	Conv. (cfs)	150420.0	85406.0
956791.2				
Length Wtd. (ft)	647.08	Wetted Per. (ft)	777.84	55.53
2234.95				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.05	0.09
0.06				
Alpha	1.44	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	18172.22	10305.26
25494.68				
C & E Loss (ft)	0.00	Cum SA (acres)	2899.46	706.47
3615.93				

Note: Multiple critical depths were found at this location. The critical depth

with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	127.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	127.97	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	121.75	Flow Area (sq ft)	5187.10	577.95
18516.04				
E.G. Slope (ft/ft)	0.000200	Area (sq ft)	5187.10	577.95
18516.04				
Q Total (cfs)	26361.00	Flow (cfs)	3819.69	1654.44
20886.87				
Top Width (ft)	3119.21	Top Width (ft)	790.34	50.00
2278.86				
Vel Total (ft/s)	1.09	Avg. Vel. (ft/s)	0.74	2.86
1.13				
Max Chl Dpth (ft)	14.52	Hydr. Depth (ft)	6.56	11.56
8.13				
Conv. Total (cfs)	1863679.0	Conv. (cfs)	270045.5	116966.3
1476667.0				
Length Wtd. (ft)	642.23	Wetted Per. (ft)	790.95	55.53
2282.71				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.08	0.13
0.10				
Alpha	1.36	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	23601.25	11483.54
33224.39				
C & E Loss (ft)	0.01	Cum SA (acres)	3214.99	706.20
3970.39				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	127.84	Element	Left OB	Channel
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PatuxentRiver.rep

Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	127.77	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	122.39	Flow Area (sq ft)	5031.88	568.13
18068.50				
E.G. Slope (ft/ft)	0.000544	Area (sq ft)	5031.88	568.13
18068.50				
Q Total (cfs)	41717.00	Flow (cfs)	5989.94	2650.65
33076.42				
Top Width (ft)	3116.11	Top Width (ft)	789.62	50.00
2276.50				
Vel Total (ft/s)	1.76	Avg. Vel. (ft/s)	1.19	4.67
1.83				
Max Chl Dpth (ft)	14.32	Hydr. Depth (ft)	6.37	11.36
7.94				
Conv. Total (cfs)	1789009.0	Conv. (cfs)	256874.8	113671.4
1418462.0				
Length Wtd. (ft)	642.32	Wetted Per. (ft)	790.20	55.53
2280.34				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.22	0.35
0.27				
Alpha	1.37	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	34219.17	13633.64
46992.60				
C & E Loss (ft)	0.02	Cum SA (acres)	3610.03	708.06
4568.39				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 194817.8

CROSS SECTION OUTPUT Profile #10yr

PatuxentRiver.rep				
E.G. Elev (ft)	123.98	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	123.95	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)	120.17	Flow Area (sq ft)	1426.35	402.19
6861.77				
E.G. Slope (ft/ft)	0.000292	Area (sq ft)	1426.35	402.19
6861.77				
Q Total (cfs)	8893.00	Flow (cfs)	763.49	1092.35
7037.16				
Top Width (ft)	1818.84	Top Width (ft)	465.45	50.00
1303.40				
Vel Total (ft/s)	1.02	Avg. Vel. (ft/s)	0.54	2.72
1.03				
Max Chl Dpth (ft)	11.00	Hydr. Depth (ft)	3.06	8.04
5.26				
Conv. Total (cfs)	520362.8	Conv. (cfs)	44674.7	63917.4
411770.7				
Length Wtd. (ft)	807.55	Wetted Per. (ft)	466.08	55.53
1305.20				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.06	0.13
0.10				
Alpha	1.68	Stream Power (lb/ft s)	5597.03	0.00
2243.11				
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	10048.43	7779.50
14945.04				
C & E Loss (ft)	0.02	Cum SA (acres)	2373.60	695.75
3122.41				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	125.85	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	125.82	Reach Len. (ft)	862.16	963.36
666.85				

PatuxentRiver.rep

Crit W.S. (ft) 9298.77	120.80	Flow Area (sq ft)	2299.14	495.33
E.G. Slope (ft/ft) 9298.77	0.000308	Area (sq ft)	2299.14	495.33
Q Total (cfs) 11863.74	15174.00	Flow (cfs)	1722.30	1587.96
Top Width (ft) 1312.99	1834.58	Top Width (ft)	471.59	50.00
Vel Total (ft/s) 1.28	1.25	Avg. Vel. (ft/s)	0.75	3.21
Max Chl Dpth (ft) 7.08	12.87	Hydr. Depth (ft)	4.88	9.91
Conv. Total (cfs) 675739.9	864287.4	Conv. (cfs)	98099.6	90448.0
Length Wtd. (ft) 1314.97	803.94	Wetted Per. (ft)	472.50	55.53
Min Ch El (ft) 0.14	112.95	Shear (lb/sq ft)	0.09	0.17
Alpha 2243.11	1.53	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 25323.50	0.46	Cum Volume (acre-ft)	18130.42	10296.70
C & E Loss (ft) 3589.94	0.03	Cum SA (acres)	2890.65	705.60

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	127.95	Element	Left OB	Channel
Vel Head (ft) 0.059	0.01	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 666.85	127.94	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 40995.92	121.67	Flow Area (sq ft)	3309.50	601.66
E.G. Slope (ft/ft) 46269.04	0.000029	Area (sq ft)	3309.50	601.66
Q Total (cfs) 24726.22	26361.00	Flow (cfs)	960.55	674.23

PatuxentRiver.rep

Top Width (ft) 4420.01	4948.62	Top Width (ft)	478.61	50.00
Vel Total (ft/s) 0.60	0.59	Avg. Vel. (ft/s)	0.29	1.12
Max Chl Dpth (ft) 9.28	14.99	Hydr. Depth (ft)	6.91	12.03
Conv. Total (cfs) 4586786.0	4890043.0	Conv. (cfs)	178184.6	125072.2
Length Wtd. (ft) 4426.03	782.03	Wetted Per. (ft)	479.84	55.53
Min Ch El (ft) 0.02	112.95	Shear (lb/sq ft)	0.01	0.02
Alpha 2243.11	1.09	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 32749.32	0.07	Cum Volume (acre-ft)	23541.32	11473.17
C & E Loss (ft) 3921.26	0.04	Cum SA (acres)	3206.04	705.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	127.72	Element	Left OB	Channel
Vel Head (ft) 0.059	0.02	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 666.85	127.70	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 39925.27	122.49	Flow Area (sq ft)	3193.65	589.55
E.G. Slope (ft/ft) 45198.39	0.000080	Area (sq ft)	3193.65	589.55
Q Total (cfs) 39139.93	41717.00	Flow (cfs)	1498.99	1078.09
Top Width (ft) 4418.72	4946.54	Top Width (ft)	477.81	50.00
Vel Total (ft/s) 0.98	0.95	Avg. Vel. (ft/s)	0.47	1.83
Max Chl Dpth (ft) 9.04	14.75	Hydr. Depth (ft)	6.68	11.79

PatuxentRiver.rep				
Conv. Total (cfs) 4389401.0	4678411.0	Conv. (cfs)	168105.9	120903.7
Length Wtd. (ft) 4424.72	784.81	Wetted Per. (ft)	479.00	55.53
Min Ch El (ft) 0.04	112.95	Shear (lb/sq ft)	0.03	0.05
Alpha 2243.11	1.09	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 46528.67	0.21	Cum Volume (acre-ft)	34161.15	13623.47
C & E Loss (ft) 4519.29	0.23	Cum SA (acres)	3601.09	707.18

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193854.4

#### CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	123.52	Element	Left OB	Channel
Vel Head (ft) 0.080	0.25	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	123.27	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 86.00	121.50	Flow Area (sq ft)	4174.90	476.14
E.G. Slope (ft/ft) 86.00	0.001301	Area (sq ft)	4174.90	476.14
Q Total (cfs) 115.40	8893.00	Flow (cfs)	5664.13	3113.47
Top Width (ft) 29.90	1116.10	Top Width (ft)	1036.20	50.00
Vel Total (ft/s)	1.88	Avg. Vel. (ft/s)	1.36	6.54

PatuxentRiver.rep

1.34				
Max Chl Dpth (ft)	10.97	Hydr. Depth (ft)	4.03	9.52
2.88				
Conv. Total (cfs)	246538.8	Conv. (cfs)	157025.6	86314.0
3199.2				
Length Wtd. (ft)	504.39	Wetted Per. (ft)	1036.70	53.97
30.34				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.33	0.72
0.23				
Alpha	4.59	Stream Power (lb/ft s)	5419.00	0.00
1878.29				
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	9993.00	7769.79
14891.86				
C & E Loss (ft)	0.10	Cum SA (acres)	2358.74	694.64
3112.20				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	125.37	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.29	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.08	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	122.42	Flow Area (sq ft)	6107.19	566.34
148.19				
E.G. Slope (ft/ft)	0.001408	Area (sq ft)	6107.19	566.34
148.19				
Q Total (cfs)	15174.00	Flow (cfs)	10603.22	4324.08
246.71				
Top Width (ft)	1200.15	Top Width (ft)	1110.63	50.00
39.52				
Vel Total (ft/s)	2.22	Avg. Vel. (ft/s)	1.74	7.64
1.66				



PatuxentRiver.rep

Max Chl Dpth (ft) 3.75	12.78	Hydr. Depth (ft)	5.50	11.33
Conv. Total (cfs) 6575.6	404440.5	Conv. (cfs)	282613.1	115251.8
Length Wtd. (ft) 40.14	505.61	Wetted Per. (ft)	1111.24	53.97
Min Ch El (ft) 0.32	112.30	Shear (lb/sq ft)	0.48	0.92
Alpha 1878.29	3.79	Stream Power (lb/ft s)	5419.00	0.00
Frctn Loss (ft) 25251.19	1.16	Cum Volume (acre-ft)	18047.23	10284.96
C & E Loss (ft) 3579.59	0.14	Cum SA (acres)	2874.99	704.49

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	127.84	Element	Left OB	Channel
Vel Head (ft) 0.080	0.37	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	127.47	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 259.45	123.67	Flow Area (sq ft)	8922.38	685.98
E.G. Slope (ft/ft) 259.45	0.001586	Area (sq ft)	8922.38	685.98
Q Total (cfs) 526.66	26361.00	Flow (cfs)	19517.51	6316.82
Top Width (ft) 56.26	1360.95	Top Width (ft)	1254.69	50.00
Vel Total (ft/s) 2.03	2.67	Avg. Vel. (ft/s)	2.19	9.21
Max Chl Dpth (ft)	15.17	Hydr. Depth (ft)	7.11	13.72

PatuxentRiver.rep

4.61				
Conv. Total (cfs)	661958.7	Conv. (cfs)	490109.9	158623.6
13225.2				
Length Wtd. (ft)	506.55	Wetted Per. (ft)	1255.32	53.97
57.07				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.70	1.26
0.45				
Alpha	3.36	Stream Power (lb/ft s)	5419.00	0.00
1878.29				
Frctn Loss (ft)	1.38	Cum Volume (acre-ft)	23420.27	11458.94
32393.18				
C & E Loss (ft)	0.19	Cum SA (acres)	3188.88	704.21
3887.00				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	127.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.28	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.99	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	124.99	Flow Area (sq ft)	6013.12	562.10
144.86				
E.G. Slope (ft/ft)	0.011083	Area (sq ft)	6013.12	562.10
144.86				
Q Total (cfs)	41717.00	Flow (cfs)	29062.67	11982.37
671.96				
Top Width (ft)	1195.68	Top Width (ft)	1106.64	50.00
39.04				
Vel Total (ft/s)	6.21	Avg. Vel. (ft/s)	4.83	21.32
4.64				
Max Chl Dpth (ft)	12.69	Hydr. Depth (ft)	5.43	11.24
3.71				

PatuxentRiver.rep				
Conv. Total (cfs) 6382.8	396255.9	Conv. (cfs)	276056.6	113816.6
Length Wtd. (ft) 39.65	497.12	Wetted Per. (ft)	1107.25	53.97
Min Ch El (ft) 2.53	112.30	Shear (lb/sq ft)	3.76	7.21
Alpha 1878.29	3.82	Stream Power (lb/ft s)	5419.00	0.00
Frctn Loss (ft) 46181.59	0.30	Cum Volume (acre-ft)	34070.04	13610.73
C & E Loss (ft) 4485.17	0.67	Cum SA (acres)	3585.41	706.08

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193357.9

#### CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	122.44	Element	Left OB	Channel
Vel Head (ft) 0.055	1.21	Wt. n-Val.	0.100	0.030

PatuxentRiver.rep

W.S. Elev (ft) 183.70	121.23	Reach Len. (ft)	178.50	181.30
Crit W.S. (ft) 13.07	119.99	Flow Area (sq ft)	1991.08	520.71
E.G. Slope (ft/ft) 13.07	0.003281	Area (sq ft)	1991.08	520.71
Q Total (cfs) 26.53	8893.00	Flow (cfs)	3167.31	5699.17
Top Width (ft) 8.08	852.25	Top Width (ft)	779.17	65.00
Vel Total (ft/s) 2.03	3.52	Avg. Vel. (ft/s)	1.59	10.95
Max Chl Dpth (ft) 1.62	8.63	Hydr. Depth (ft)	2.56	8.01
Conv. Total (cfs) 463.1	155248.9	Conv. (cfs)	55293.0	99492.8
Length Wtd. (ft) 8.71	180.24	Wetted Per. (ft)	779.31	68.72
Min Ch El (ft) 0.31	112.60	Shear (lb/sq ft)	0.52	1.55
Alpha 1920.00	6.26	Stream Power (lb/ft s)	5267.00	0.00
Frctn Loss (ft) 14891.31	0.70	Cum Volume (acre-ft)	9956.72	7764.11
C & E Loss (ft) 3111.99	0.02	Cum SA (acres)	2348.06	693.99

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	124.07	Element	Left OB	Channel
Vel Head (ft) 0.055	1.68	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 183.70	122.38	Reach Len. (ft)	178.50	181.30
Crit W.S. (ft) 24.03	122.33	Flow Area (sq ft)	2891.14	595.52
E.G. Slope (ft/ft) 24.03	0.004432	Area (sq ft)	2891.14	595.52
Q Total (cfs) 69.43	15174.00	Flow (cfs)	6819.93	8284.63
Top Width (ft)	860.89	Top Width (ft)	784.92	65.00

PatuxentRiver.rep

10.96				
Vel Total (ft/s)	4.32	Avg. Vel. (ft/s)	2.36	13.91
2.89				
Max Chl Dpth (ft)	9.78	Hydr. Depth (ft)	3.68	9.16
2.19				
Conv. Total (cfs)	227920.6	Conv. (cfs)	102438.6	124439.1
1042.9				
Length Wtd. (ft)	179.96	Wetted Per. (ft)	785.18	68.72
11.81				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	1.02	2.40
0.56				
Alpha	5.79	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.93	Cum Volume (acre-ft)	17994.29	10278.34
25250.23				
C & E Loss (ft)	0.08	Cum SA (acres)	2863.84	703.83
3579.31				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	126.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.31	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	123.97	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	123.97	Flow Area (sq ft)	4140.00	698.42
44.52				
E.G. Slope (ft/ft)	0.005680	Area (sq ft)	4140.00	698.42
44.52				
Q Total (cfs)	26361.00	Flow (cfs)	13949.90	12232.28
178.82				
Top Width (ft)	872.76	Top Width (ft)	792.84	65.00
14.92				
Vel Total (ft/s)	5.40	Avg. Vel. (ft/s)	3.37	17.51
4.02				
Max Chl Dpth (ft)	11.37	Hydr. Depth (ft)	5.22	10.74
2.98				
Conv. Total (cfs)	349767.2	Conv. (cfs)	185092.2	162302.3

PatuxentRiver.rep

2372.7				
Length Wtd. (ft)	182.98	Wetted Per. (ft)	793.25	68.72
16.07				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	1.85	3.60
0.98				
Alpha	5.09	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	23343.41	11451.05
32391.49				
C & E Loss (ft)	0.01	Cum SA (acres)	3176.84	703.56
3886.61				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	125.07	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	124.10	Flow Area (sq ft)	5382.86	769.74
24963.99				
E.G. Slope (ft/ft)	0.000196	Area (sq ft)	5382.86	769.74
27445.10				
Q Total (cfs)	41717.00	Flow (cfs)	2939.36	2670.32
36107.32				

PatuxentRiver.rep

Top Width (ft)	4662.23	Top Width (ft)	1264.11	65.00
3333.12				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	0.55	3.47
1.45				
Max Chl Dpth (ft)	12.47	Hydr. Depth (ft)	4.26	11.84
7.49				
Conv. Total (cfs)	2981651.0	Conv. (cfs)	210085.7	190856.4
2580708.0				
Length Wtd. (ft)	183.00	Wetted Per. (ft)	1264.54	68.72
3335.23				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.05	0.14
0.09				
Alpha	1.45	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	34002.98	13603.14
46028.35				
C & E Loss (ft)	0.00	Cum SA (acres)	3571.46	705.42
4466.44				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1

RS: 193176.6

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	121.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	120.59	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)	120.59	Flow Area (sq ft)	2087.20	471.54
18.40				
E.G. Slope (ft/ft)	0.004741	Area (sq ft)	2087.20	471.54
18.40				
Q Total (cfs)	8893.00	Flow (cfs)	3645.42	5200.43
47.15				
Top Width (ft)	1006.29	Top Width (ft)	935.41	60.00
10.87				
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)	1.75	11.03
2.56				
Max Chl Dpth (ft)	8.29	Hydr. Depth (ft)	2.23	7.86

PatuxentRiver.rep

1.69				
Conv. Total (cfs)	129159.2	Conv. (cfs)	52944.9	75529.5
684.8				
Length Wtd. (ft)	311.52	Wetted Per. (ft)	935.77	64.34
11.39				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.66	2.17
0.48				
Alpha	6.08	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	1.52	Cum Volume (acre-ft)	9948.37	7762.04
14891.25				
C & E Loss (ft)	0.22	Cum SA (acres)	2344.54	693.73
3111.95				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	123.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.41	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	121.64	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)	121.64	Flow Area (sq ft)	3095.06	535.08
31.72				
E.G. Slope (ft/ft)	0.006046	Area (sq ft)	3095.06	535.08
31.72				
Q Total (cfs)	15174.00	Flow (cfs)	7813.94	7250.04
110.02				
Top Width (ft)	1062.25	Top Width (ft)	987.98	60.00



PatuxentRiver.rep

14.27				
Vel Total (ft/s)	4.14	Avg. Vel. (ft/s)	2.52	13.55
3.47				
Max Chl Dpth (ft)	9.34	Hydr. Depth (ft)	3.13	8.92
2.22				
Conv. Total (cfs)	195155.6	Conv. (cfs)	100496.5	93244.1
1415.0				
Length Wtd. (ft)	310.86	Wetted Per. (ft)	988.46	64.34
14.95				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	1.18	3.14
0.80				
Alpha	5.30	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	17982.02	10275.99
25250.12				
C & E Loss (ft)	0.35	Cum SA (acres)	2860.21	703.57
3579.25				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	122.65	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	122.59	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)	122.59	Flow Area (sq ft)	4132.74	591.80
12042.18				

PatuxentRiver.rep				
E.G. Slope (ft/ft)	0.000401	Area (sq ft)	4132.74	591.80
15233.57				
Q Total (cfs)	26361.00	Flow (cfs)	2988.32	2209.35
21163.34				
Top Width (ft)	4025.65	Top Width (ft)	1233.79	60.00
2731.85				
Vel Total (ft/s)	1.57	Avg. Vel. (ft/s)	0.72	3.73
1.76				
Max Chl Dpth (ft)	10.29	Hydr. Depth (ft)	3.35	9.86
5.86				
Conv. Total (cfs)	1315960.0	Conv. (cfs)	149178.8	110292.2
1056489.0				
Length Wtd. (ft)	319.35	Wetted Per. (ft)	1234.41	64.34
2057.85				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.08	0.23
0.15				
Alpha	1.50	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	23326.46	11448.36
32359.28				
C & E Loss (ft)	0.01	Cum SA (acres)	3172.68	703.30
3880.81				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

#### CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				

PatuxentRiver.rep

W.S. Elev (ft) 325.30	125.00	Reach Len. (ft)	299.20	309.60
Crit W.S. (ft) 16985.17	122.59	Flow Area (sq ft)	7277.33	736.12
E.G. Slope (ft/ft) 22060.85	0.000312	Area (sq ft)	7277.33	736.12
Q Total (cfs) 33108.07	41717.00	Flow (cfs)	5805.89	2803.04
Top Width (ft) 2963.22	4395.99	Top Width (ft)	1372.77	60.00
Vel Total (ft/s) 1.95	1.67	Avg. Vel. (ft/s)	0.80	3.81
Max Chl Dpth (ft) 8.27	12.70	Hydr. Depth (ft)	5.30	12.27
Conv. Total (cfs) 1874158.0	2361486.0	Conv. (cfs)	328655.7	158672.4
Length Wtd. (ft) 2057.85	319.42	Wetted Per. (ft)	1373.45	64.34
Min Ch El (ft) 0.16	112.30	Shear (lb/sq ft)	0.10	0.22
Alpha 1905.04	1.46	Stream Power (lb/ft s)	5282.77	0.00
Frctn Loss (ft) 45923.96	0.12	Cum Volume (acre-ft)	33977.05	13600.01
C & E Loss (ft) 4453.17	0.00	Cum SA (acres)	3566.05	705.16

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 192867

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	119.16	Element	Left OB	Channel
Vel Head (ft) 0.055	0.39	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	118.76	Reach Len. (ft)	93.00	92.30
Crit W.S. (ft) 2047.47		Flow Area (sq ft)	986.58	327.57
E.G. Slope (ft/ft)	0.005052	Area (sq ft)	986.58	327.57

PatuxentRiver.rep

2104.48				
Q Total (cfs)	8893.00	Flow (cfs)	969.66	2739.45
5183.89				
Top Width (ft)	2589.85	Top Width (ft)	1098.81	68.56
1422.49				
Vel Total (ft/s)	2.65	Avg. Vel. (ft/s)	0.98	8.36
2.53				
Max Chl Dpth (ft)	6.46	Hydr. Depth (ft)	0.90	4.78
1.44				
Conv. Total (cfs)	125119.7	Conv. (cfs)	13642.6	38542.6
72934.5				
Length Wtd. (ft)	92.18	Wetted Per. (ft)	1098.95	71.00
1422.58				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.28	1.46
0.45				
Alpha	3.63	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	9937.81	7759.20
14883.32				
C & E Loss (ft)	0.08	Cum SA (acres)	2337.56	693.27
3106.60				

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.01	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.26	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	119.76	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	2083.14	396.66
3554.25				
E.G. Slope (ft/ft)	0.003456	Area (sq ft)	2083.14	396.66
3611.26				
Q Total (cfs)	15174.00	Flow (cfs)	2778.42	3061.52
9334.06				
Top Width (ft)	2879.13	Top Width (ft)	1103.79	70.21
1705.13				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.33	7.72
2.63				

PatuxentRiver.rep

Max Chl Dpth (ft) 2.08	7.46	Hydr. Depth (ft)	1.89	5.65
Conv. Total (cfs) 158786.7	258133.1	Conv. (cfs)	47265.2	52081.2
Length Wtd. (ft) 1705.27	92.22	Wetted Per. (ft)	1104.02	72.93
Min Ch El (ft) 0.45	112.30	Shear (lb/sq ft)	0.41	1.17
Alpha 0.00	2.62	Stream Power (lb/ft s)	5084.00	0.00
Frctn Loss (ft) 25236.51	0.22	Cum Volume (acre-ft)	17964.24	10272.68
C & E Loss (ft) 3572.83	0.04	Cum SA (acres)	2853.02	703.11

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	121.62	Element	Left OB	Channel
Vel Head (ft) 0.055	0.15	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	121.47	Reach Len. (ft)	93.00	92.30
Crit W.S. (ft) 6834.90		Flow Area (sq ft)	4057.19	520.89
E.G. Slope (ft/ft) 6891.90	0.001812	Area (sq ft)	4057.19	520.89
Q Total (cfs) 17329.89	26361.00	Flow (cfs)	5716.53	3314.58
Top Width (ft) 2087.84	3383.85	Top Width (ft)	1220.16	75.84
Vel Total (ft/s) 2.54	2.31	Avg. Vel. (ft/s)	1.41	6.36
Max Chl Dpth (ft) 3.27	9.17	Hydr. Depth (ft)	3.33	6.87
Conv. Total (cfs) 407090.3	619236.9	Conv. (cfs)	134285.0	77861.6
Length Wtd. (ft) 2088.06	92.25	Wetted Per. (ft)	1220.44	78.84
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.38	0.75

PatuxentRiver.rep

0.37				
Alpha	1.83	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	23298.33	11444.41
32276.66				
C & E Loss (ft)	0.01	Cum SA (acres)	3164.26	702.81
3862.82				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	124.87	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	8596.70	821.79
15409.58				
E.G. Slope (ft/ft)	0.000489	Area (sq ft)	8596.70	821.79
15466.59				
Q Total (cfs)	41717.00	Flow (cfs)	9350.51	3250.50
29115.99				
Top Width (ft)	4261.31	Top Width (ft)	1428.04	92.00
2741.27				
Vel Total (ft/s)	1.68	Avg. Vel. (ft/s)	1.09	3.96
1.89				
Max Chl Dpth (ft)	12.57	Hydr. Depth (ft)	6.02	8.93
5.62				
Conv. Total (cfs)	1885696.0	Conv. (cfs)	422662.5	146929.4
1316104.0				
Length Wtd. (ft)	92.26	Wetted Per. (ft)	1428.34	95.09
2741.52				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.18	0.26
0.17				
Alpha	1.41	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	33922.53	13594.47
45783.84				
C & E Loss (ft)	0.00	Cum SA (acres)	3556.44	704.62
4431.87				

PatuxentRiver.rep

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 192774.7

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	118.71	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	1206.93	391.02
4442.56				
E.G. Slope (ft/ft)	0.001612	Area (sq ft)	1206.93	391.02
4442.56				
Q Total (cfs)	8893.00	Flow (cfs)	798.63	2021.39
6072.98				
Top Width (ft)	3027.28	Top Width (ft)	1098.46	69.00
1859.83				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	0.66	5.17
1.37				
Max Chl Dpth (ft)	6.91	Hydr. Depth (ft)	1.10	5.67
2.39				
Conv. Total (cfs)	221517.1	Conv. (cfs)	19893.2	50351.2
151272.8				
Length Wtd. (ft)	270.05	Wetted Per. (ft)	1098.54	74.02
1861.80				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.11	0.53
0.24				
Alpha	3.41	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	9935.47	7758.44
14876.40				
C & E Loss (ft)	0.01	Cum SA (acres)	2335.21	693.13
3103.13				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

PatuxentRiver.rep				
E.G. Elev (ft) Right OB	119.76	Element	Left OB	Channel
Vel Head (ft) 0.080	0.13	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 275.16	119.63	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 6178.65		Flow Area (sq ft)	2246.09	454.51
E.G. Slope (ft/ft) 6178.65	0.001692	Area (sq ft)	2246.09	454.51
Q Total (cfs) 10350.09	15174.00	Flow (cfs)	2162.63	2661.28
Top Width (ft) 1900.97	3105.75	Top Width (ft)	1135.78	69.00
Vel Total (ft/s) 1.68	1.71	Avg. Vel. (ft/s)	0.96	5.86
Max Chl Dpth (ft) 3.25	7.83	Hydr. Depth (ft)	1.98	6.59
Conv. Total (cfs) 251635.5	368916.4	Conv. (cfs)	52578.8	64702.0
Length Wtd. (ft) 1902.97	270.13	Wetted Per. (ft)	1135.91	74.02
Min Ch El (ft) 0.34	112.35	Shear (lb/sq ft)	0.21	0.65
Alpha 0.00	2.76	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 25226.17	0.58	Cum Volume (acre-ft)	17959.62	10271.78
C & E Loss (ft) 3569.03	0.01	Cum SA (acres)	2850.63	702.96

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	121.47	Element	Left OB	Channel
Vel Head (ft) 0.080	0.11	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 275.16	121.35	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 9519.50		Flow Area (sq ft)	4275.20	573.06
E.G. Slope (ft/ft) 9519.50	0.001318	Area (sq ft)	4275.20	573.06
Q Total (cfs) 17657.53	26361.00	Flow (cfs)	5247.26	3456.21



PatuxentRiver.rep

Top Width (ft) 2084.25	3398.65	Top Width (ft)	1245.39	69.00
Vel Total (ft/s) 1.85	1.83	Avg. Vel. (ft/s)	1.23	6.03
Max Chl Dpth (ft) 4.57	9.55	Hydr. Depth (ft)	3.43	8.31
Conv. Total (cfs) 486421.3	726180.3	Conv. (cfs)	144549.0	95210.0
Length Wtd. (ft) 2086.29	269.97	Wetted Per. (ft)	1245.55	74.02
Min Ch El (ft) 0.38	112.35	Shear (lb/sq ft)	0.28	0.64
Alpha 0.00	2.19	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 32259.33	0.40	Cum Volume (acre-ft)	23289.44	11443.25
C & E Loss (ft) 3858.41	0.00	Cum SA (acres)	3161.62	702.66

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.89	Element	Left OB	Channel
Vel Head (ft) 0.080	0.06	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 275.16	124.82	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 17861.13		Flow Area (sq ft)	9002.96	812.74
E.G. Slope (ft/ft) 17861.13	0.000528	Area (sq ft)	9002.96	812.74
Q Total (cfs) 27447.23	41717.00	Flow (cfs)	10354.51	3915.25
Top Width (ft) 2610.77	4135.00	Top Width (ft)	1455.23	69.00
Vel Total (ft/s) 1.54	1.51	Avg. Vel. (ft/s)	1.15	4.82
Max Chl Dpth (ft) 6.84	13.02	Hydr. Depth (ft)	6.19	11.78
Conv. Total (cfs) 1194944.0	1816194.0	Conv. (cfs)	450794.6	170454.6
Length Wtd. (ft) 2612.81	269.92	Wetted Per. (ft)	1455.42	74.02
Min Ch El (ft) 0.23	112.35	Shear (lb/sq ft)	0.20	0.36

PatuxentRiver.rep

Alpha 0.00	1.79	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 45748.64	0.15	Cum Volume (acre-ft)	33903.74	13592.74
C & E Loss (ft) 4426.21	0.00	Cum SA (acres)	3553.36	704.45

CROSS SECTION

RIVER: Patuxent River  
REACH: 1

RS: 192514.9

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	118.28	Element	Left OB	Channel
Vel Head (ft) 0.100	0.18	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 848.74	118.10	Reach Len. (ft)	640.52	833.38
Crit W.S. (ft) 3937.69	116.87	Flow Area (sq ft)	1199.73	337.34
E.G. Slope (ft/ft) 3938.17	0.002582	Area (sq ft)	1199.73	337.34
Q Total (cfs) 5602.96	8893.00	Flow (cfs)	1100.68	2189.36
Top Width (ft) 1627.09	2757.59	Top Width (ft)	1067.50	63.00
Vel Total (ft/s) 1.42	1.62	Avg. Vel. (ft/s)	0.92	6.49
Max Chl Dpth (ft) 2.43	6.00	Hydr. Depth (ft)	1.12	5.35
Conv. Total (cfs) 110258.0	175001.1	Conv. (cfs)	21659.7	43083.4
Length Wtd. (ft) 1621.91	805.58	Wetted Per. (ft)	1067.98	64.66
Min Ch El (ft) 0.39	112.40	Shear (lb/sq ft)	0.18	0.84
Alpha 0.00	4.45	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft) 14849.93	2.10	Cum Volume (acre-ft)	9928.25	7756.27
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73

3092.12

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.96	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	117.78	Flow Area (sq ft)	2253.03	392.13
5529.78				
E.G. Slope (ft/ft)	0.002836	Area (sq ft)	2253.03	392.13
5576.99				
Q Total (cfs)	15174.00	Flow (cfs)	2639.22	2948.16
9586.61				
Top Width (ft)	3399.87	Top Width (ft)	1250.13	63.00
2086.74				
Vel Total (ft/s)	1.86	Avg. Vel. (ft/s)	1.17	7.52
1.73				
Max Chl Dpth (ft)	6.86	Hydr. Depth (ft)	1.80	6.22
2.81				
Conv. Total (cfs)	284959.4	Conv. (cfs)	49563.2	55364.9
180031.4				
Length Wtd. (ft)	796.34	Wetted Per. (ft)	1250.75	64.66
1971.56				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.32	1.07
0.50				
Alpha	3.81	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	1.62	Cum Volume (acre-ft)	17946.12	10269.25
25189.04				
C & E Loss (ft)	0.05	Cum SA (acres)	2843.47	702.57
3556.43				

Warning: Divided flow computed for this cross-section.

PatuxentRiver.rep

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.07	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	120.93	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	118.59	Flow Area (sq ft)	4760.85	515.99
9607.51				
E.G. Slope (ft/ft)	0.001662	Area (sq ft)	4760.85	515.99
10041.32				
Q Total (cfs)	26361.00	Flow (cfs)	6730.64	3566.25
16064.11				
Top Width (ft)	3812.47	Top Width (ft)	1334.53	63.00
2414.94				
Vel Total (ft/s)	1.77	Avg. Vel. (ft/s)	1.41	6.91
1.67				
Max Chl Dpth (ft)	8.83	Hydr. Depth (ft)	3.57	8.19
4.59				
Conv. Total (cfs)	646659.3	Conv. (cfs)	165108.7	87483.4
394067.2				
Length Wtd. (ft)	785.60	Wetted Per. (ft)	1335.21	64.66
2094.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.37	0.83
0.48				
Alpha	2.77	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	23262.33	11440.00
32197.55				
C & E Loss (ft)	0.03	Cum SA (acres)	3153.88	702.27
3844.20				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

PatuxentRiver.rep

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.74	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	124.68	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	119.34	Flow Area (sq ft)	10251.30	751.90
17441.39				
E.G. Slope (ft/ft)	0.000562	Area (sq ft)	10251.30	751.90
20377.96				
Q Total (cfs)	41717.00	Flow (cfs)	12595.08	3884.38
25237.54				
Top Width (ft)	4684.81	Top Width (ft)	1573.02	63.00
3048.79				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	1.23	5.17
1.45				
Max Chl Dpth (ft)	12.58	Hydr. Depth (ft)	6.52	11.93
8.34				
Conv. Total (cfs)	1759759.0	Conv. (cfs)	531301.4	163855.9
1064602.0				
Length Wtd. (ft)	780.73	Wetted Per. (ft)	1573.73	64.66
2094.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.23	0.41
0.29				
Alpha	1.96	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	33845.98	13588.08
45627.87				
C & E Loss (ft)	0.01	Cum SA (acres)	3544.27	704.06
4408.34				

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 191681.5

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	116.14	Element	Left OB	Channel
Vel Head (ft) 0.100	0.05	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	116.08	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 4395.76		Flow Area (sq ft)	2137.27	121.79
E.G. Slope (ft/ft) 4395.76	0.002637	Area (sq ft)	2137.27	121.79
Q Total (cfs) 5896.26	8893.00	Flow (cfs)	2379.06	617.68
Top Width (ft) 1895.14	3148.48	Top Width (ft)	1212.34	41.00
Vel Total (ft/s) 1.34	1.34	Avg. Vel. (ft/s)	1.11	5.07
Max Chl Dpth (ft) 2.32	9.51	Hydr. Depth (ft)	1.76	2.97
Conv. Total (cfs) 114828.3	173189.3	Conv. (cfs)	46331.7	12029.2
Length Wtd. (ft) 1900.50	801.69	Wetted Per. (ft)	1212.90	43.25
Min Ch El (ft) 0.38	112.33	Shear (lb/sq ft)	0.29	0.46
Alpha 0.00	1.85	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 14768.74	0.91	Cum Volume (acre-ft)	9903.71	7751.88
C & E Loss (ft) 3057.80	0.01	Cum SA (acres)	2311.95	691.74

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	117.50	Element	Left OB	Channel
Vel Head (ft) 0.100	0.05	Wt. n-Val.	0.100	0.030

PatuxentRiver.rep

W.S. Elev (ft) 801.75	117.45	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 7032.12		Flow Area (sq ft)	3797.18	177.80
E.G. Slope (ft/ft) 7032.12	0.001535	Area (sq ft)	3797.18	177.80
Q Total (cfs) 9572.88	15174.00	Flow (cfs)	4715.78	885.34
Top Width (ft) 1960.99	3219.79	Top Width (ft)	1217.80	41.00
Vel Total (ft/s) 1.36	1.38	Avg. Vel. (ft/s)	1.24	4.98
Max Chl Dpth (ft) 3.59	10.88	Hydr. Depth (ft)	3.12	4.34
Conv. Total (cfs) 244359.7	387335.1	Conv. (cfs)	120376.1	22599.3
Length Wtd. (ft) 1966.36	801.68	Wetted Per. (ft)	1218.53	43.25
Min Ch El (ft) 0.34	112.33	Shear (lb/sq ft)	0.30	0.39
Alpha 0.00	1.63	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 25066.21	0.58	Cum Volume (acre-ft)	17901.64	10263.80
C & E Loss (ft) 3517.00	0.01	Cum SA (acres)	2825.33	701.58

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	120.26	Element	Left OB	Channel
Vel Head (ft) 0.100	0.04	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	120.22	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 12580.66		Flow Area (sq ft)	7180.89	291.20
E.G. Slope (ft/ft) 12580.66	0.000662	Area (sq ft)	7180.89	291.20
Q Total (cfs) 16142.55	26361.00	Flow (cfs)	8895.16	1323.29

PatuxentRiver.rep

Top Width (ft) 2041.00	3312.38	Top Width (ft)	1230.38	41.00
Vel Total (ft/s) 1.28	1.31	Avg. Vel. (ft/s)	1.24	4.54
Max Chl Dpth (ft) 6.16	13.65	Hydr. Depth (ft)	5.84	7.10
Conv. Total (cfs) 627341.3	1024457.0	Conv. (cfs)	345689.0	51426.4
Length Wtd. (ft) 2046.42	801.67	Wetted Per. (ft)	1231.43	43.25
Min Ch El (ft) 0.25	112.33	Shear (lb/sq ft)	0.24	0.28
Alpha 0.00	1.48	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 31977.16	0.30	Cum Volume (acre-ft)	23174.54	11432.28
C & E Loss (ft) 3800.79	0.01	Cum SA (acres)	3135.03	701.27

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.42	Element	Left OB	Channel
Vel Head (ft) 0.100	0.03	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	124.38	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 21240.01		Flow Area (sq ft)	12486.36	462.02
E.G. Slope (ft/ft) 21240.01	0.000304	Area (sq ft)	12486.36	462.02
Q Total (cfs) 25552.04	41717.00	Flow (cfs)	14228.39	1936.57
Top Width (ft) 2119.43	3514.33	Top Width (ft)	1353.90	41.00
Vel Total (ft/s) 1.20	1.22	Avg. Vel. (ft/s)	1.14	4.19
Max Chl Dpth (ft) 10.02	17.81	Hydr. Depth (ft)	9.22	11.27
Conv. Total (cfs) 1464485.0	2390961.0	Conv. (cfs)	815483.5	110992.1



PatuxentRiver.rep				
Length Wtd. (ft) 2124.97	801.66	Wetted Per. (ft)	1355.06	43.25
Min Ch El (ft) 0.19	112.33	Shear (lb/sq ft)	0.18	0.20
Alpha 0.00	1.44	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 45222.42	0.16	Cum Volume (acre-ft)	33678.81	13576.46
C & E Loss (ft) 4357.99	0.01	Cum SA (acres)	3522.75	703.06

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190879.0

#### CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) Right OB	115.22	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	115.21	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 7874.60		Flow Area (sq ft)	3318.91	89.96
E.G. Slope (ft/ft) 7874.60	0.000624	Area (sq ft)	3318.91	89.96
Q Total (cfs) 6350.13	8893.00	Flow (cfs)	2361.45	181.41
Top Width (ft) 2455.94	3743.54	Top Width (ft)	1250.49	37.11
Vel Total (ft/s) 0.81	0.79	Avg. Vel. (ft/s)	0.71	2.02
Max Chl Dpth (ft) 3.21	9.39	Hydr. Depth (ft)	2.65	2.42
Conv. Total (cfs) 254119.2	355879.5	Conv. (cfs)	94500.5	7259.8
Length Wtd. (ft)	779.48	Wetted Per. (ft)	1251.21	43.26

PatuxentRiver.rep

2460.41				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.10	0.08
0.12				
Alpha	1.10	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	9853.52	7749.93
14655.82				
C & E Loss (ft)	0.00	Cum SA (acres)	2289.30	691.02
3017.76				

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	116.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	116.90	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	5468.69	152.65
12046.76				
E.G. Slope (ft/ft)	0.000419	Area (sq ft)	5468.69	152.65
12046.76				
Q Total (cfs)	15174.00	Flow (cfs)	4322.45	358.87
10492.68				
Top Width (ft)	3825.23	Top Width (ft)	1305.37	37.11
2482.75				
Vel Total (ft/s)	0.86	Avg. Vel. (ft/s)	0.79	2.35
0.87				
Max Chl Dpth (ft)	11.08	Hydr. Depth (ft)	4.19	4.11
4.85				
Conv. Total (cfs)	741042.0	Conv. (cfs)	211092.6	17525.8
512423.5				
Length Wtd. (ft)	776.38	Wetted Per. (ft)	1306.15	43.26
2487.28				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.11	0.09
0.13				
Alpha	1.13	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	17816.40	10260.76
24890.63				
C & E Loss (ft)	0.00	Cum SA (acres)	2802.12	700.86
3476.10				

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	119.95	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	119.93	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 19651.20		Flow Area (sq ft)	9638.57	265.42
E.G. Slope (ft/ft) 19651.20	0.000241	Area (sq ft)	9638.57	265.42
Q Total (cfs) 17804.63	26361.00	Flow (cfs)	7872.25	684.12
Top Width (ft) 2520.46	4003.83	Top Width (ft)	1446.25	37.11
Vel Total (ft/s) 0.91	0.89	Avg. Vel. (ft/s)	0.82	2.58
Max Chl Dpth (ft) 7.80	14.11	Hydr. Depth (ft)	6.66	7.15
Conv. Total (cfs) 1146717.0	1697795.0	Conv. (cfs)	507016.9	44061.3
Length Wtd. (ft) 2525.11	773.95	Wetted Per. (ft)	1447.07	43.26
Min Ch El (ft) 0.12	108.76	Shear (lb/sq ft)	0.10	0.09
Alpha 0.00	1.16	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 31680.54	0.17	Cum Volume (acre-ft)	23019.82	11427.15
C & E Loss (ft) 3758.81	0.00	Cum SA (acres)	3110.41	700.55

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.25	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	124.24	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 30628.53		Flow Area (sq ft)	16422.08	425.24
E.G. Slope (ft/ft)	0.000135	Area (sq ft)	16422.08	425.24

PatuxentRiver.rep

30628.53				
Q Total (cfs)	41717.00	Flow (cfs)	13032.10	1125.12
27559.78				
Top Width (ft)	4283.81	Top Width (ft)	1670.19	37.11
2576.51				
Vel Total (ft/s)	0.88	Avg. Vel. (ft/s)	0.79	2.65
0.90				
Max Chl Dpth (ft)	18.42	Hydr. Depth (ft)	9.83	11.46
11.89				
Conv. Total (cfs)	3583823.0	Conv. (cfs)	1119561.0	96657.0
2367605.0				
Length Wtd. (ft)	772.15	Wetted Per. (ft)	1671.06	43.26
2581.34				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.08	0.08
0.10				
Alpha	1.19	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	33412.89	13568.29
44745.08				
C & E Loss (ft)	0.00	Cum SA (acres)	3494.94	702.34
4314.77				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 190151.1

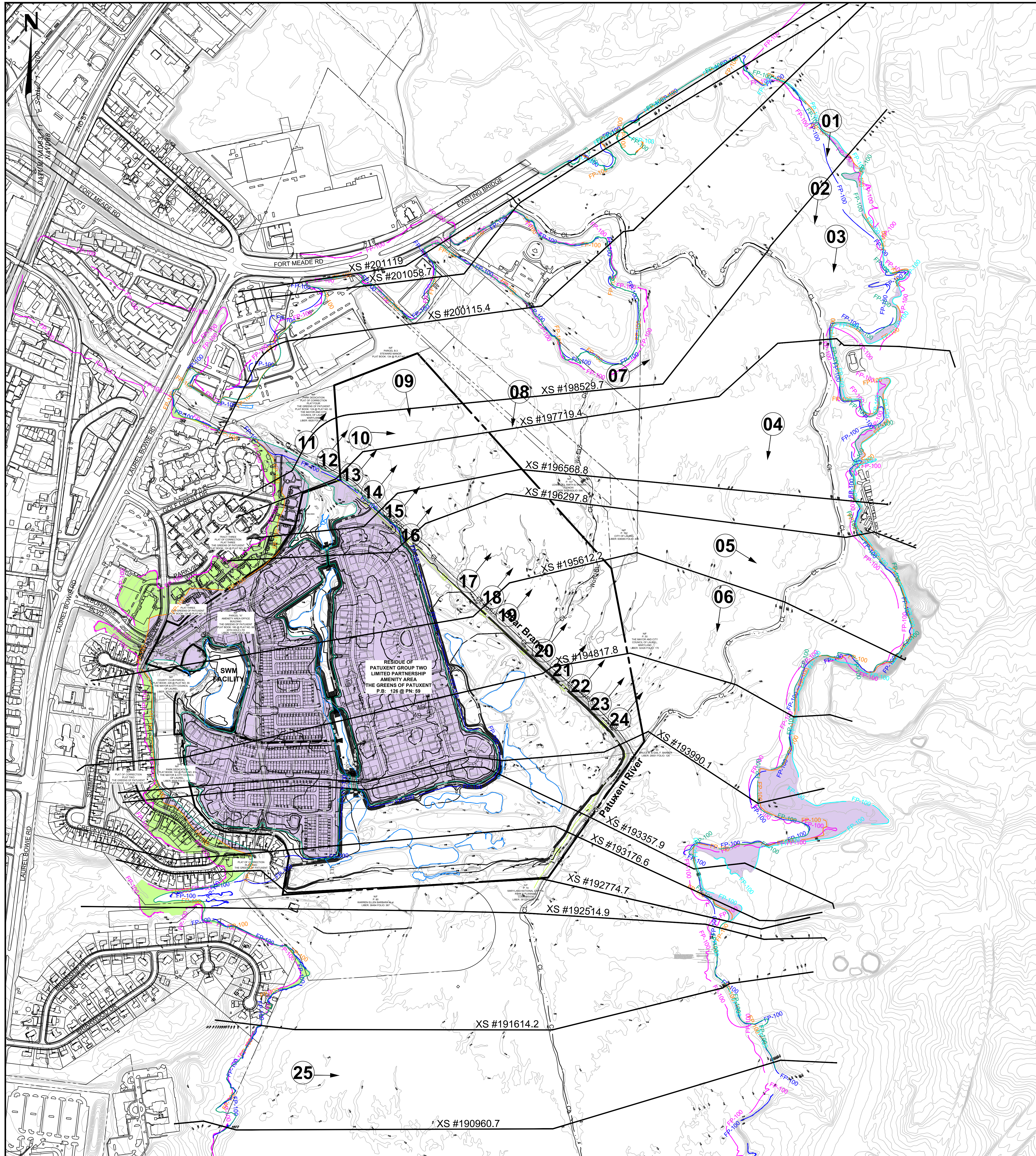
CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	114.86	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.120	0.030
0.120				
W.S. Elev (ft)	114.85	Reach Len. (ft)	831.46	1141.85
524.30				
Crit W.S. (ft)		Flow Area (sq ft)	2716.67	119.95
12163.19				
E.G. Slope (ft/ft)	0.000354	Area (sq ft)	2716.67	119.95
12163.19				
Q Total (cfs)	8893.00	Flow (cfs)	1213.09	214.37
7465.53				
Top Width (ft)	3904.10	Top Width (ft)	1023.01	39.10
2842.00				

## **Appendix H**

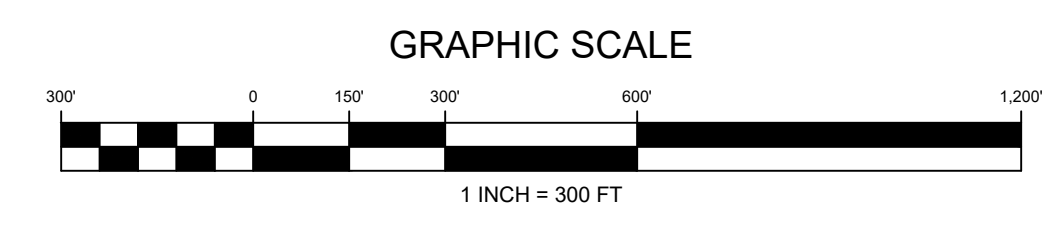
### **Site Photographs**



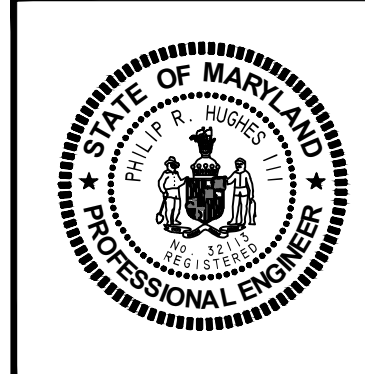


**LEGEND**

	Property Boundary
	Adjacent Property Boundary
	Existing Stream Centerline
	Revised Existing FEMA
	Revised Existing with Levee
	Revised Proposed
	Existing FEMA Limits
	Approved CLOMR Limits
	Existing Minor Contour
	Existing Major Contour
	Proposed Minor Contour
	Proposed Major Contour
	Isolated Wetland
	Irrigation Pond
	Stream Buffer
	Reduction from Existing to Proposed Floodplain
	Reduction from Existing FEMA Limits to Revised Existing FEMA
	Site Photo and View Direction



**PROFESSIONAL CERTIFICATION**  
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.  
 LICENSE NO.: 32113      EXPIRATION DATE: 9/15/19



REVISION	DATE	REVISION	DATE	REVISION	DATE

Prepared For:  
 CS PATUXENT GREENS, LLC  
 6290 Montrose Road  
 Rockville, MD 20852  
 Attn: Alan D. Cohen  
 Phone: 301-692-4000

## FLOODPLAIN STUDY COMPARISON

**RODGERS CONSULTING**  
 1101 Mercantile Lane, Suite 280, Largo, Maryland 20774  
 Ph: 301.948.4700 Fax: 301.948.6256 www.rodgers.com

BY	DATE
CADD	01/2018
DESIGNED	01/2018
DRAWN	01/2018
REVIEWED	

RODGERS CONTACT:  
 RELEASE FOR   
 BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**Patuxent Greens**  
 10th Election District  
 The City of Laurel  
 Prince George's County, Maryland  
 Tax Map 41-E4

SCALE: 1" = 300'
JOB No. 1262A
DATE: APR. 2019
SHEET No. 1 of 1

PRELIMINARY NOT FOR CONSTRUCTION





SITE PHOTO : 01



SITE PHOTO : 02



SITE PHOTO : 03



SITE PHOTO : 04





SITE PHOTO : 05



SITE PHOTO : 06



SITE PHOTO : 07



SITE PHOTO : 08





SITE PHOTO : 09

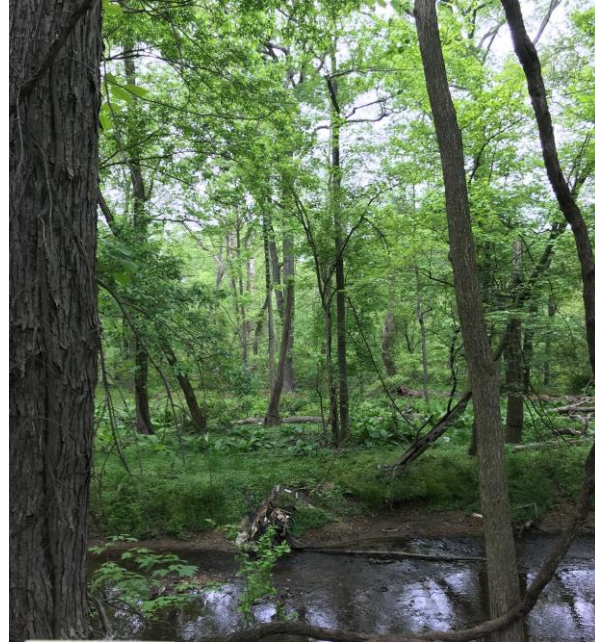


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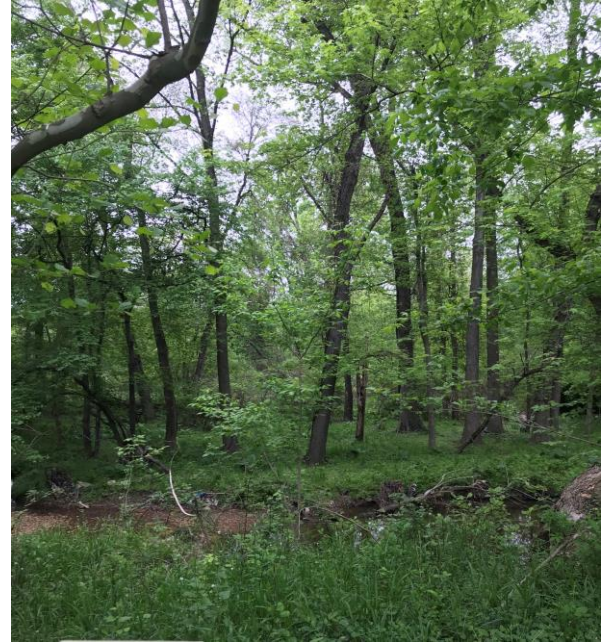
SITE PHOTO : 11



SITE PHOTO : 12



SITE PHOTO : 13



SITE PHOTO : 14





SITE PHOTO : 15



SITE PHOTO : 16



SITE PHOTO : 17



SITE PHOTO : 18





SITE PHOTO : 19



SITE PHOTO : 20



SITE PHOTO : 21



SITE PHOTO : 22





SITE PHOTO : 23



SITE PHOTO : 24



SITE PHOTO : 25

## Appendix I

### Manning's Roughness Coefficient



**Table 3-1 Manning's 'n' Values**

Type of Channel and Description	Minimum	Normal	Maximum
<b>A. Natural Streams</b>			
<b>1. Main Channels</b>			
a. Clean, straight, full, no rifts or deep pools			
b. Same as above, but more stones and weeds	0.025	0.030	0.033
c. Clean, winding, some pools and shoals	0.030	0.035	0.040
d. Same as above, but some weeds and stones	0.033	0.040	0.045
e. Same as above, lower stages, more ineffective slopes and sections	0.035	0.045	0.050
f. Same as "d" but more stones	0.040	0.048	0.055
g. Sluggish reaches, weedy, deep pools	0.045	0.050	0.060
h. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.050	0.070	0.080
	0.070	0.100	0.150
<b>2. Flood Plains</b>			
a. Pasture no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
2. Same as above, but heavy sprouts	0.050	0.060	0.080
3. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.080	0.100	0.120
4. Same as above, but with flow into branches	0.100	0.120	0.160
5. Dense willows, summer, straight	0.110	0.150	0.200
<b>3. Mountain Streams, no vegetation in channel, banks usually steep, with trees and brush on banks submerged</b>			
a. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
b. Bottom: cobbles with large boulders	0.040	0.050	0.070

Table 3-1 (Continued) Manning's 'n' Values

Type of Channel and Description	Minimum	Normal	Maximum
<b>B. Lined or Built-Up Channels</b>			
<b>1. Concrete</b>			
a. Trowel finish	0.011	0.013	0.015
b. Float Finish	0.013	0.015	0.016
c. Finished, with gravel bottom	0.015	0.017	0.020
d. Unfinished	0.014	0.017	0.020
e. Gunite, good section	0.016	0.019	0.023
f. Gunite, wavy section	0.018	0.022	0.025
g. On good excavated rock	0.017	0.020	
h. On irregular excavated rock	0.022	0.027	
<b>2. Concrete bottom float finished with sides of:</b>			
a. Dressed stone in mortar	0.015	0.017	0.020
b. Random stone in mortar	0.017	0.020	0.024
c. Cement rubble masonry, plastered	0.016	0.020	0.024
d. Cement rubble masonry	0.020	0.025	0.030
e. Dry rubble on riprap	0.020	0.030	0.035
<b>3. Gravel bottom with sides of:</b>			
a. Formed concrete	0.017	0.020	0.025
b. Random stone in mortar	0.020	0.023	0.026
c. Dry rubble or riprap	0.023	0.033	0.036
<b>4. Brick</b>			
a. Glazed	0.011	0.013	0.015
b. In cement mortar	0.012	0.015	0.018
<b>5. Metal</b>			
a. Smooth steel surfaces	0.011	0.012	0.014
b. Corrugated metal	0.021	0.025	0.030
<b>6. Asphalt</b>			
a. Smooth	0.013	0.013	
b. Rough	0.016	0.016	
<b>7. Vegetal lining</b>			
	0.030		0.500



**Table 3-1 (Continued) Manning's 'n' Values**

Type of Channel and Description	Minimum	Normal	Maximum
<i>C. Excavated or Dredged Channels</i>			
<b>1. Earth, straight and uniform</b>			
a. Clean, recently completed	0.016	0.018	0.020
b. Clean, after weathering	0.018	0.022	0.025
c. Gravel, uniform section, clean	0.022	0.025	0.030
d. With short grass, few weeds	0.022	0.027	0.033
<b>2. Earth, winding and sluggish</b>			
a. No vegetation	0.023	0.025	0.030
b. Grass, some weeds	0.025	0.030	0.033
c. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
d. Earth bottom and rubble side	0.028	0.030	0.035
e. Stony bottom and weedy banks	0.025	0.035	0.040
f. Cobble bottom and clean sides	0.030	0.040	0.050
<b>3. Dragline-excavated or dredged</b>			
a. No vegetation	0.025	0.028	0.033
b. Light brush on banks	0.035	0.050	0.060
<b>4. Rock cuts</b>			
a. Smooth and uniform	0.025	0.035	0.040
b. Jagged and irregular	0.035	0.040	0.050
<b>5. Channels not maintained, weeds and brush</b>			
a. Clean bottom, brush on sides	0.040	0.050	0.080
b. Same as above, highest stage of flow	0.045	0.070	0.110
c. Dense weeds, high as flow depth	0.050	0.080	0.120
d. Dense brush, high stage	0.080	0.100	0.140

Other sources that include pictures of selected streams as a guide to n value determination are available (Fasken, 1963; Barnes, 1967; and Hicks and Mason, 1991). In general, these references provide color photos with tables of calibrated n values for a range of flows.

Although there are many factors that affect the selection of the n value for the channel, some of the most important factors are the type and size of materials that compose the bed and banks of a channel, and the shape of the channel. Cowan (1956) developed a procedure for estimating the effects of these factors to determine the value of Manning's n of a channel. In Cowan's procedure, the value of n is computed by the following equation:



**EXISTING WITHOUT BERM**

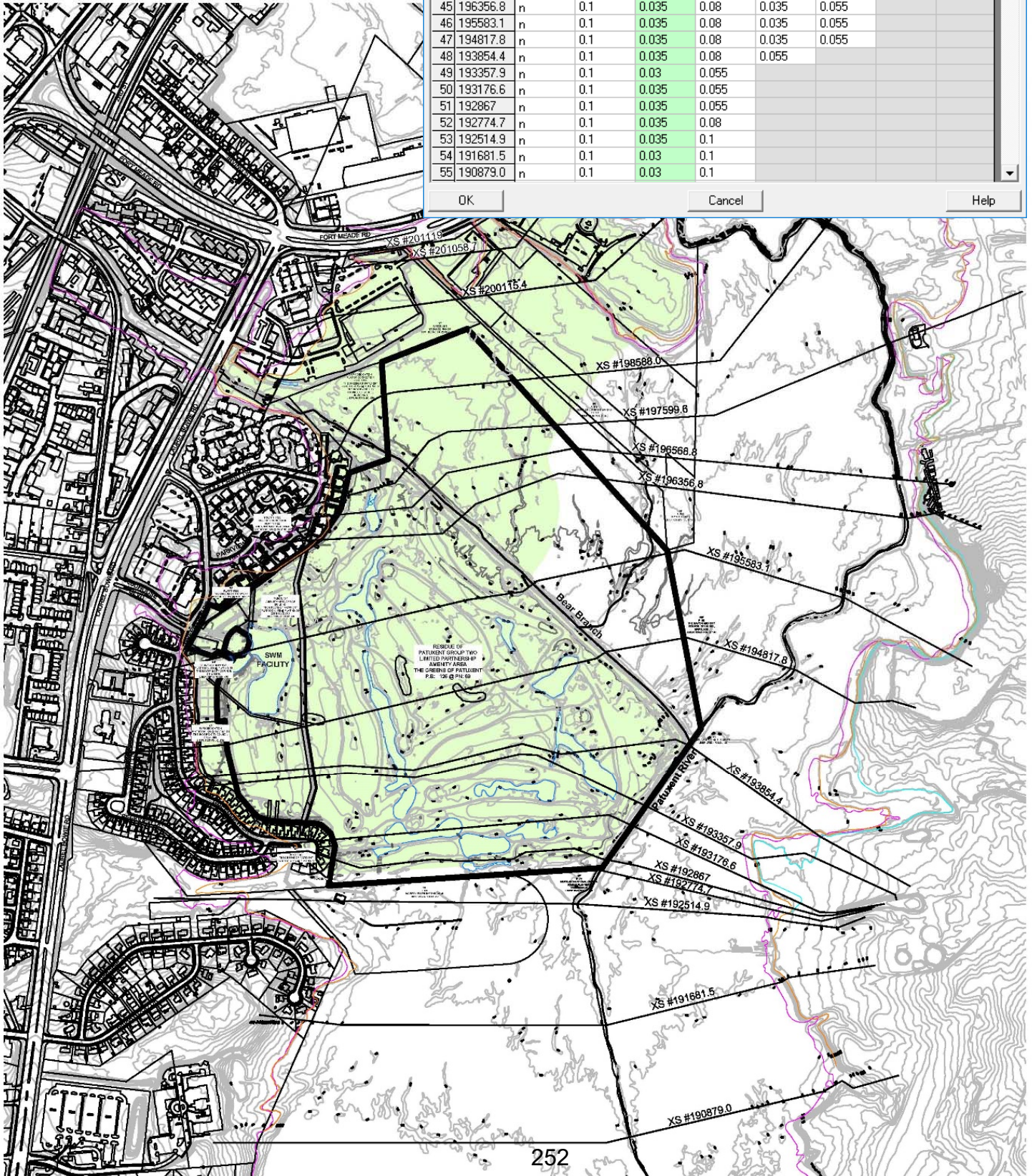
**Edit Manning's n or k Values**

River: **Patuxent River**  Edit Interpolated XS's Channel n Values have a light green background

Reach: **1** All Regions

Selected Area Edit Options:

river Station	Frctn (n/K)	n #1	n #2	n #3	n #4	n #5	n #6	n #7
39	201119	n	0.1	0.03	0.1			
40	201058.7	n	0.1	0.035	0.1			
41	200115.4	n	0.1	0.035	0.1			
42	198588.0	n	0.1	0.035	0.08			
43	197599.6	n	0.04	0.1	0.035	0.08	0.035	0.05
44	196568.8	n	0.1	0.035	0.08	0.035	0.055	
45	196356.8	n	0.1	0.035	0.08	0.035	0.055	
46	195583.1	n	0.1	0.035	0.08	0.035	0.055	
47	194817.8	n	0.1	0.035	0.08	0.035	0.055	
48	193854.4	n	0.1	0.035	0.08	0.055		
49	193357.9	n	0.1	0.03	0.055			
50	193176.6	n	0.1	0.035	0.055			
51	192867	n	0.1	0.035	0.055			
52	192774.7	n	0.1	0.035	0.08			
53	192514.9	n	0.1	0.035	0.1			
54	191681.5	n	0.1	0.03	0.1			
55	190879.0	n	0.1	0.03	0.1			





**EXISTING WITH BERM**

**Edit Manning's n or k Values**

River: Patuxent River  Edit Interpolated XS's Channel n Values have a light green background

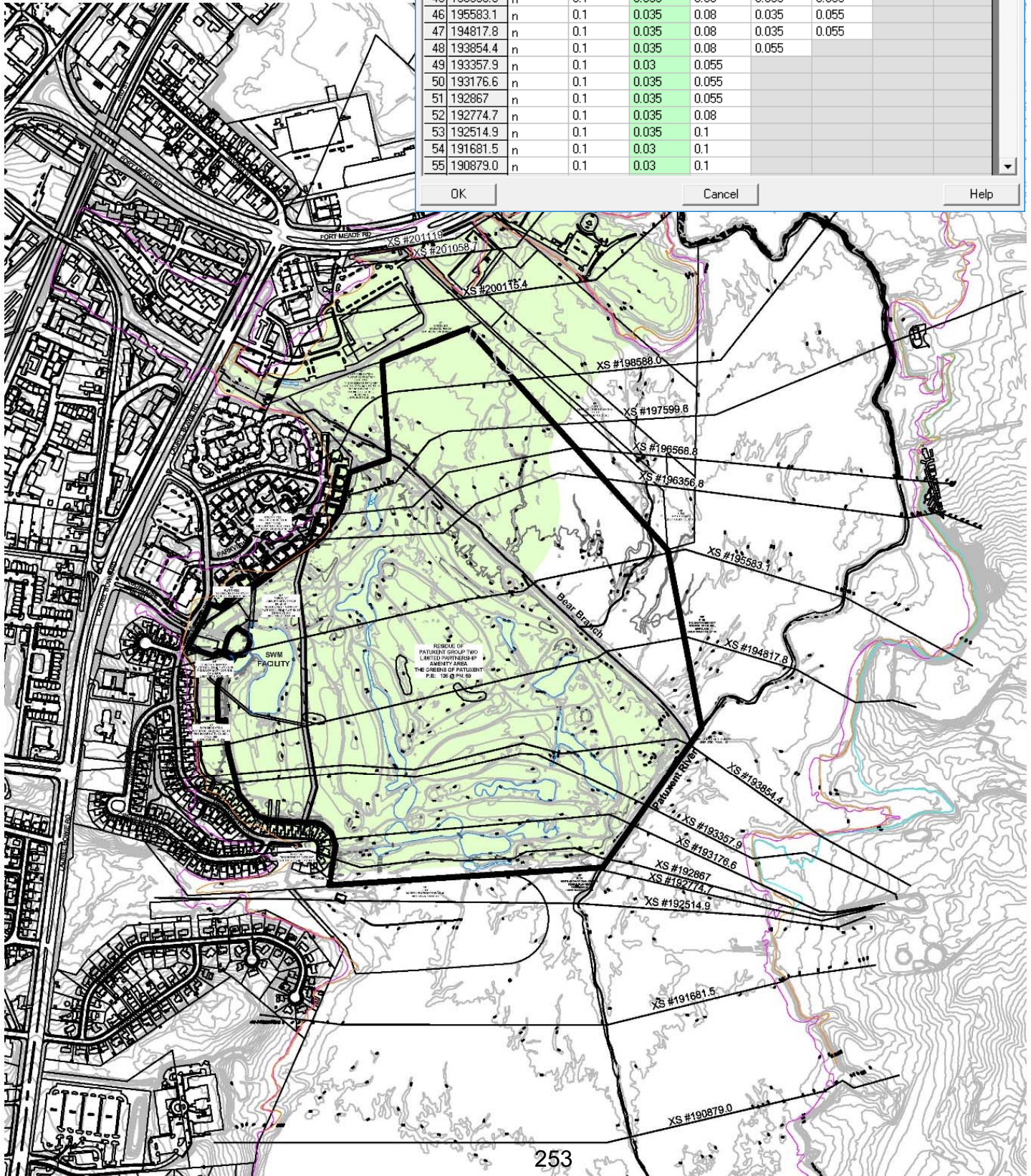
Reach: 1 All Regions

Selected Area Edit Options

Add Constant ... Multiply Factor ... Set Values ... Replace ... Reduce to L Ch R ...

river Station	Frctn (n/K)	n #1	n #2	n #3	n #4	n #5	n #6	n #7
39 20111.9	n	0.1	0.03	0.1				
40 201058.7	n	0.1	0.035	0.1				
41 200115.4	n	0.1	0.035	0.1				
42 198588.0	n	0.1	0.035	0.08				
43 197599.6	n	0.04	0.1	0.035	0.08	0.035	0.05	
44 196568.8	n	0.1	0.035	0.08	0.035	0.055		
45 196356.8	n	0.1	0.035	0.08	0.035	0.055		
46 195583.1	n	0.1	0.035	0.08	0.035	0.055		
47 194817.8	n	0.1	0.035	0.08	0.035	0.055		
48 193854.4	n	0.1	0.035	0.08	0.055			
49 193357.9	n	0.1	0.03	0.055				
50 193176.6	n	0.1	0.035	0.055				
51 192867	n	0.1	0.035	0.055				
52 192774.7	n	0.1	0.035	0.08				
53 192514.9	n	0.1	0.035	0.1				
54 191681.5	n	0.1	0.03	0.1				
55 190879.0	n	0.1	0.03	0.1				

OK Cancel Help





**PROPOSED**

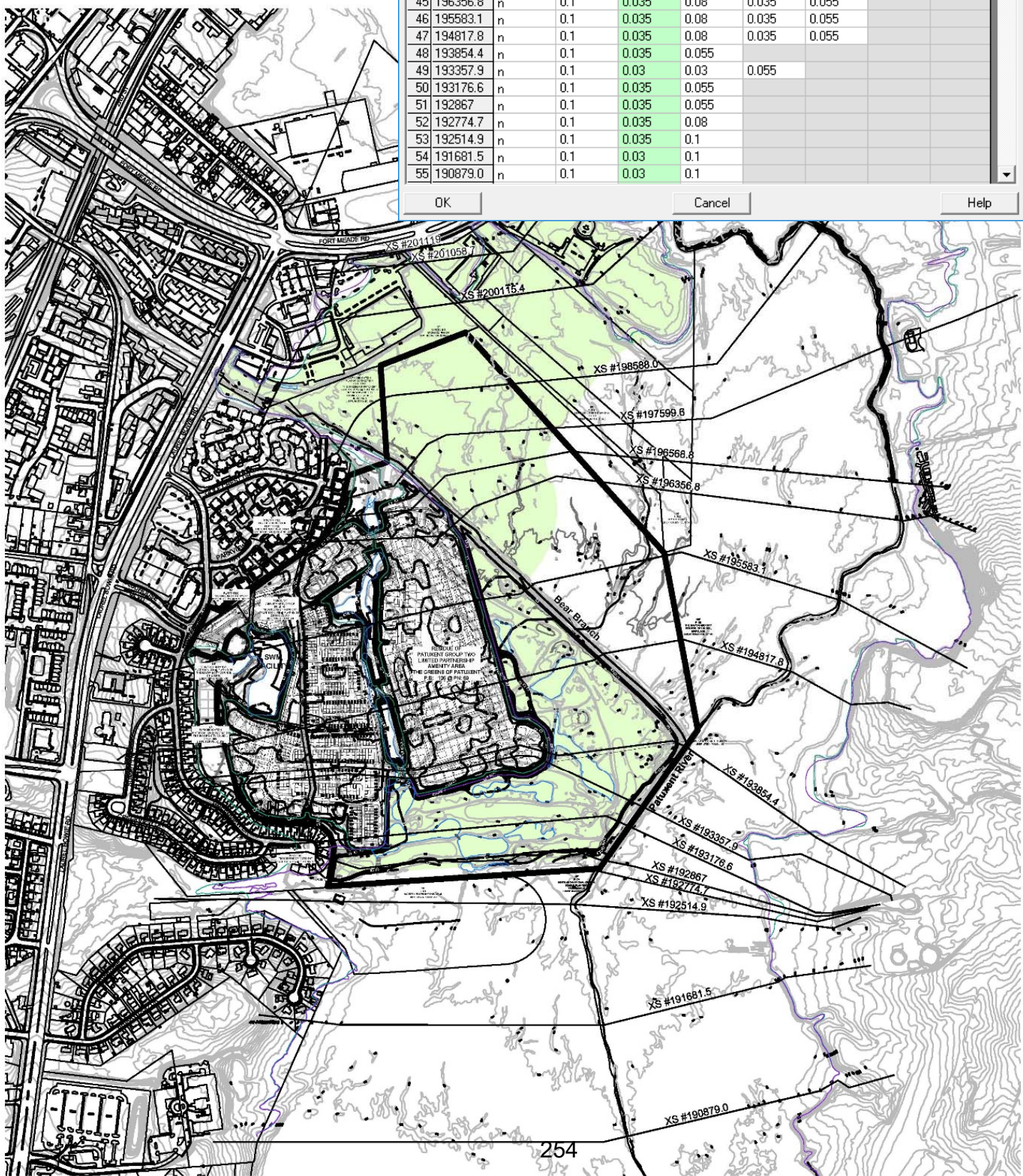
### Edit Manning's n or k Values

River: **Patuxent River**  Edit Interpolated XS's Channel n Values have a light green background

Reach: **1** All Regions

Selected Area Edit Options

river Station	Frctn (n/K)	n #1	n #2	n #3	n #4	n #5	n #6	n #7
39 201119	n	0.1	0.03	0.1				
40 201058.7	n	0.1	0.035	0.1				
41 200115.4	n	0.1	0.035	0.1				
42 198588.0	n	0.1	0.035	0.08				
43 197599.6	n	0.04	0.1	0.035	0.08	0.035	0.05	
44 196568.8	n	0.1	0.035	0.08	0.035	0.055		
45 196356.8	n	0.1	0.035	0.08	0.035	0.055		
46 195583.1	n	0.1	0.035	0.08	0.035	0.055		
47 194817.8	n	0.1	0.035	0.08	0.035	0.055		
48 193854.4	n	0.1	0.035	0.055				
49 193357.9	n	0.1	0.03	0.03	0.055			
50 193176.6	n	0.1	0.035	0.055				
51 192867	n	0.1	0.035	0.055				
52 192774.7	n	0.1	0.035	0.08				
53 192514.9	n	0.1	0.035	0.1				
54 191681.5	n	0.1	0.03	0.1				
55 190879.0	n	0.1	0.03	0.1				



## **Appendix J**

### **Sequence of Construction**

### Sequence of Construction

**NOTE: NO WORK, INCLUDING GRADING AND/OR BERM MODIFICATIONS IS TO BE PERFORMED WITHIN THE 150 FOOT WIDE MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE) TIER II BUFFER AS SHOWN ON THESE PLANS, EXCEPT CONSTRUCTION OF BASIN #1 DURING PHASE 1 (REMOVAL AND DEMOLITION WITHIN LOD AREA FOR CONSTRUCTION OF SEDIMENT BASIN/POND) WITHOUT A PERMIT FROM MDE DAM SAFETY.**

#### **PHASE 1 (REMOVAL AND DEMOLITION WITHIN LOD AREA FOR CONSTRUCTION OF SEDIMENT BASIN/POND)**

1. 48 hours prior to clearing trees, installing sediment control measures, demolition, or grading; a pre-construction meeting shall be conducted on-site with the Department of permitting, Inspections and Enforcement (DPIE) Sediment Control Inspector (301) 883-5776. (Day 1)
2. The Phase 1 limits of disturbance must be field marked prior to installing sediment control measures, demolition, or any land disturbance activity. (Days 2-7)
3. Per MDE Tier II requirements, install signage and flags for Tier II buffer zone per Maryland Department of the Environment (MDE) requirements. Signage shall state, "Tier II Waters: High Quality Waters Erosion & Sediment Control Measures Strictly Enforced and Monitored." (Days 8-10)
4. Install Stabilized Construction Entrance (Detail B-1) or Stabilized Construction Entrance with Wash Rack Option (Detail B-2) per contractor preference as shown on the plan. Install perimeter sediment control devices (Silt Fence and Super Silt Fence) as shown on the plan. Clear as necessary to install these items. (Days 11-25)
5. Upon approval of perimeter controls by the DPIE Sediment Control Inspector, demolish existing landscape walls and concrete paths as necessary to facilitate construction and installation of Sediment Basin/Pond #1. (Days 25-32)
6. Begin installation of Sediment Basin/Pond #1. (Days 33-40)

#### **PHASE 2 (REMOVAL AND DEMOLITION OUTSIDE OF SEDIMENT BASIN/POND & ROUGH GRADING)**

1. The Phase 2 limits of disturbance must be field marked prior to installing sediment control measures, demolition, or any land disturbance activity. (Days 41-47)
2. Clear and grub site. Install stockpile and staging areas as shown in plan view. Note: Exact location and dimensions of staging and stockpile areas may be modified in the field with the approval of the DPIE Sediment Control Inspector. Note: Per MDE Tier II requirements, location of stockpiles shall be greater than 100 feet from any stream resources. (Days 48-80)
3. Upon approval by the DPIE Sediment Control Inspector, begin demolition of existing clubhouse, storage sheds, paving, and landscape walls as shown in plan view. Begin removal of storm drain pipes and structures, unless otherwise noted. (Days 81-101)
4. Begin site grading, no grading shall occur within 10 feet of the embankment, as shown within green shaded area on sheets 11-14 and sheets 16-27 of the Rough Grading, Demolition, Erosion and Sediment Control Plan (Permit No. FSC #210-18). Grading shall start within the compensatory storage area to elevations shown on sheets 19-22 and sheets 24-27 of the Rough Grading, Demolition, Erosion and Sediment Control Plan (Permit No. FSC #210-18). Steep slopes, between 15% and 25% and greater than 25% as shown by gray hatches on sheet 3, are present along the uncertified levee/berm along the Bear Branch and the Patuxent River. Super Silt Fence



is provided adjacent to the Bear Branch and the Patuxent River as a redundant control. Note: Per MDE Tier II requirements, vehicles operating within the stream buffers adjacent to the Bear Branch and the Patuxent River shall carry oil/gas/grease clean up kits for spill accidents. Steep slopes, predominantly between 15% and 25%, are also present adjacent to existing golf course water hazards; these slopes will be regraded and stabilized immediately after grading per stabilization notes on Sheets 29-31 of the Rough Grading, Demolition, Erosion and Sediment Control Plan (Permit No. FSC #210-18). (Days 102-190)

5. As site grading progresses, continually maintain positive drainage to Sediment Basin/Pond #1. (Continuous)
6. As various areas of the site are brought to grade, provide temporary or permanent stabilization for all disturbed areas in accordance with the standard erosion and sediment control notes. Note: Per MDE Tier II requirements, permanent mulch application depth shall not exceed 6 inches. Temporary mulch spreading and matting to minimize compaction is allowable. (Continuous)

### **PHASE 3 (FINE GRADING)**

1. Upon approval by the DPIE Sediment Control Inspector, begin fine grading. (Days 191-321)
2. Relocate Stabilized Construction Entrance to location shown on plan. Contractor to install Stabilized Construction Entrance (Detail B-1) or Stabilized Construction Entrance with Wash Rack Option (Detail B-2) per contractor preference. (Days 322-327)
3. Upon reaching acceptable grades, install sanitary sewer lines, storm drain, water lines, curb & gutter, and paving. Note: Storm drain and sanitary sewer to be installed at the connection point and working up flow, except as noted as follows. Construct pond outfall starting at structure EW 7, then construct downstream to structure EW 900. Construct culverts in this order: From structure HW 8 downstream to structure EW 7, then construct culvert from structure HW 6 downstream to structure EW 5, then construct culvert from structure HW 545 downstream to structure EW 500, then construct culvert from structure HW 2 downstream to structure EW 1. (Days 328-380)
4. Upon reaching acceptable grades and with the approval of the DPIE Sediment Control Inspector, construction of building foundations may begin. As lots are brought to grade, construction of buildings may begin. (Days 381-500)
5. As site is stabilized, flush the storm drain system as necessary. (Days 501-510)
6. When drainage area to each ESD facility is stabilized and with approval of the DPIE Sediment Control Inspector (Days 511-560);
  - a. Prior to ESD facility excavation, provide silt fence around filter areas to prevent sediment laden runoff from construction from entering filter, tracking of sediment, and over-compaction of the ESD facility. (Days 511-560)
  - b. Excavate for ESD facility construction. (Days 511-560)
  - c. Install ESD facility stone, underdrain piping, sand, dome grate inlets, planting media, etc.
  - d. Remove underdrain blockages. (Days 511-560)
  - e. Once perimeter slopes are stabilized and with approval of the DPIE Sediment Control Inspector, install mulch and landscaping, place cap on cleanouts and remove silt fence. (Days 511-560)

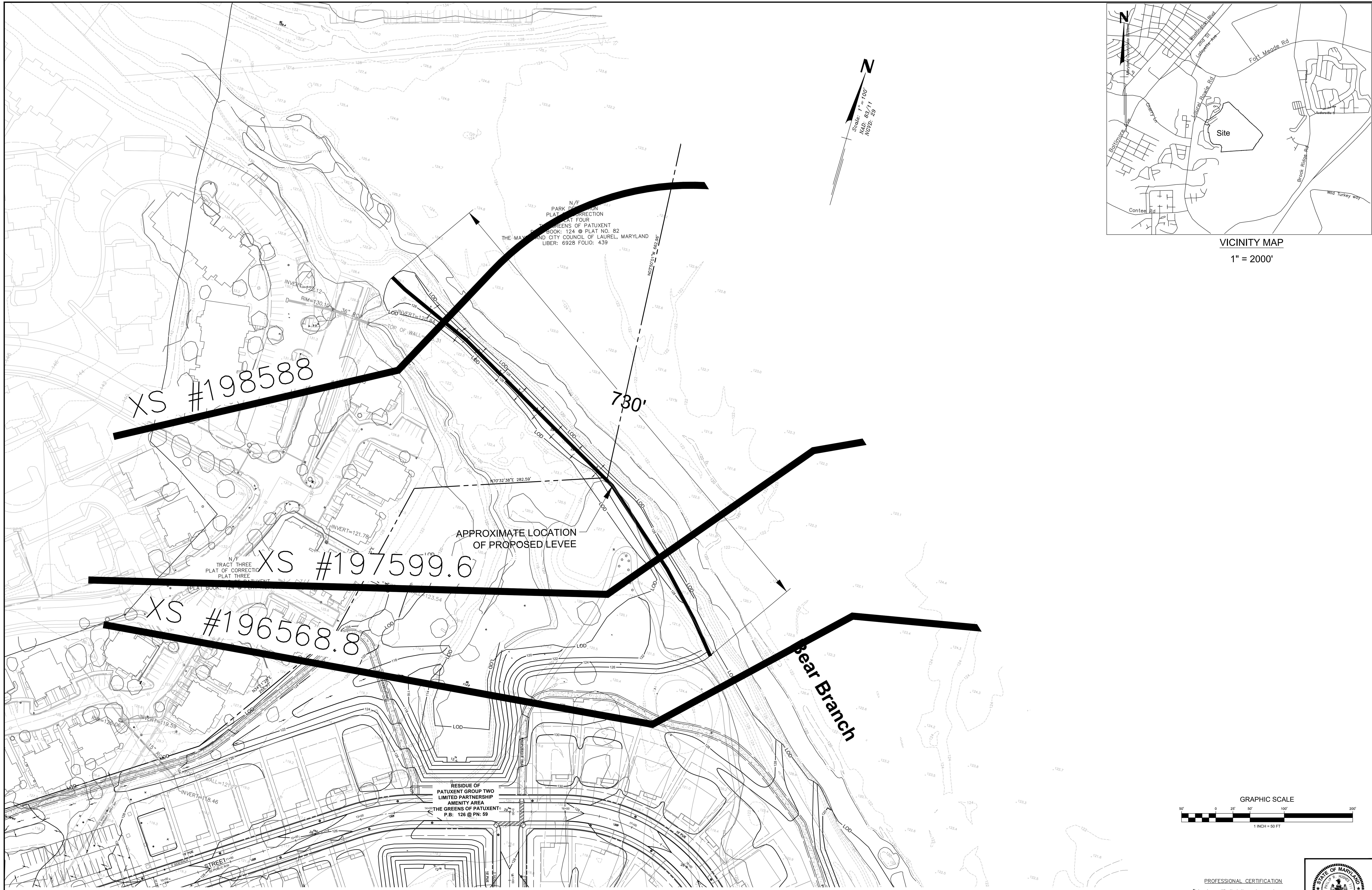
7. Once all areas draining to Sediment Basin/pond #1 are stabilized and with approval of the DPIE Sediment Control inspector: Flush storm drain as necessary. Dewater Sediment Basin/pond #1 using removable pumping station. Remove accumulated silt from Sediment Basin/pond #1 in a matter approved by the DPIE Sediment Control Inspector. Remove dewatering Device. (Days 611-620)
8. With approval of the DPIE Sediment Control Inspector, remove all remaining sediment control devices after ensuring that all areas have vegetative stabilization. (Days 621-650)



## **Appendix K**

### **Proposed Levee Draft Design**





PRELIMINARY NOT FOR CONSTRUCTION

CALL "MISS UTILITY" AT  
1-800-257-7777  
48 Hours Before Start Of Construction

REVISION	DATE	REVISION	DATE	REVISION	DATE

Prepared For:  
CS PATUXENT GREENS, LLC  
6290 Montrose Road  
Rockville, MD 20852  
Attn: Alan D. Cohen  
Phone: 301-692-4000

**Patuxent Greens**

CITY OF LAUREL  
ELECTION DISTRICT No. 10  
PRINCE GEORGE'S COUNTY, MARYLAND

**RODGERS CONSULTING**  
1101 Mercantile Lane, Suite 280, Largo, Maryland 20774  
Ph: 301.946.4700 Fx: 301.946.6256 www.rodgers.com

	BY	DATE
BASE DATA		
DESIGNED		
DRAWN		
REVIEWED		
RODGERS CONTACT: Philip R. Hughes III		
RELEASE FOR		
BY		DATE

**LEVEE EXHIBIT**

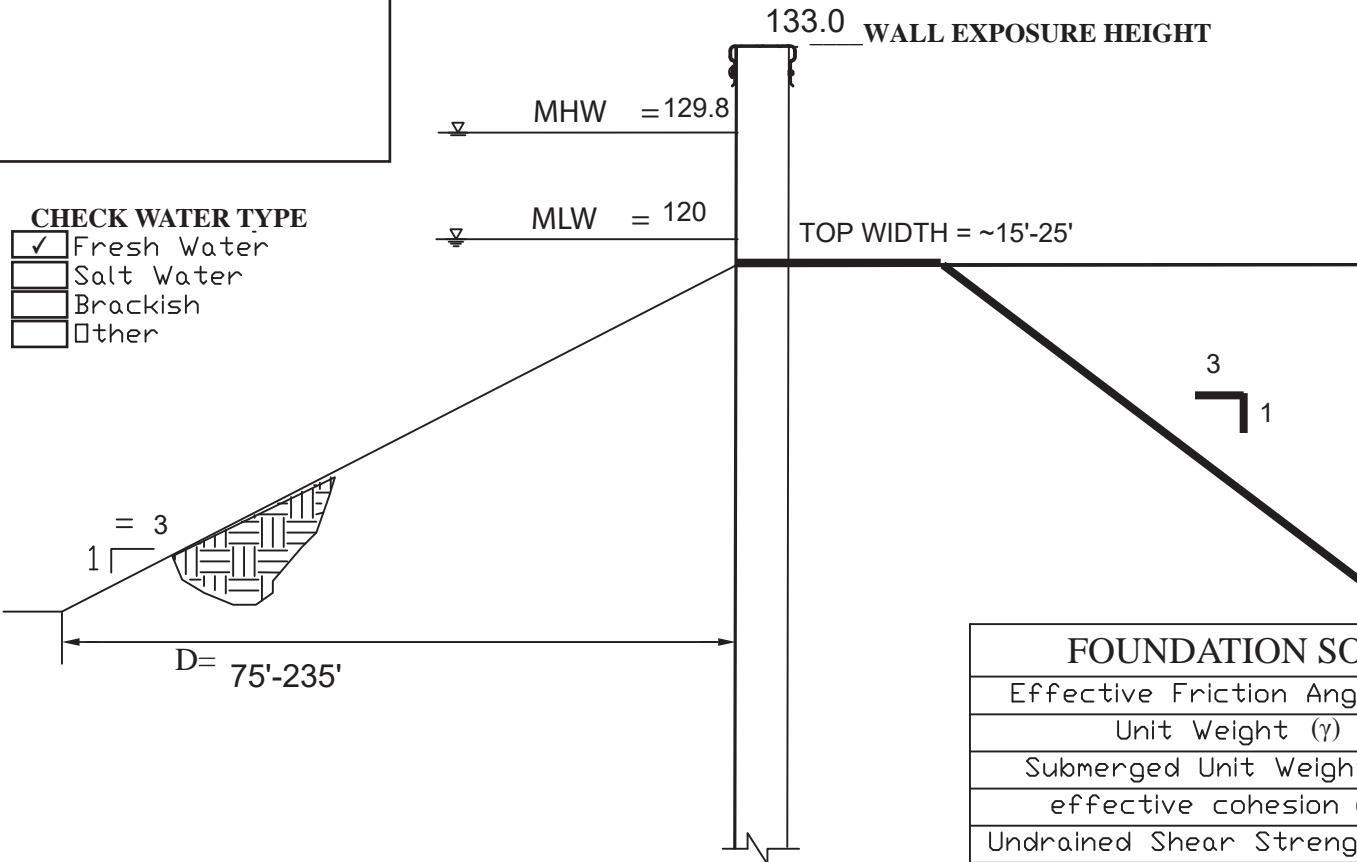


PROFESSIONAL CERTIFICATION  
I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 32113, Expiration Date: 9/15/15.

SCALE: 1"=50'
JOB No. 1262A
DATE: MAY, 2019
SHEET No. 01 of 01



NOTES: Floodplain section #198588



- CHECK WATER TYPE**
- Fresh Water
  - Salt Water
  - Brackish
  - Other

FOUNDATION SOIL: SELECT	
Effective Friction Angle ( $\theta'$ )	degrees
Unit Weight ( $\gamma$ )	pcf
Submerged Unit Weight ( $\gamma'$ )	pcf
effective cohesion ( $c'$ )	psf
Undrained Shear Strength ( $S_u$ )	psf
N value (SPT)	blows/ft

<b>PROJECT NAME</b>	Patuxent Greens
<b>STREET ADDRESS</b>	14415 Greenview Drive
<b>CITY, STATE</b>	Laurel, MD
<b>PHONE</b>	301-948-4700
<b>E-MAIL</b>	PHUGHES@RODGERS.com
<b>FAX</b>	N/A



1165 Northchase Pkwy SE,  
Suite 300, Marietta, GA 30067

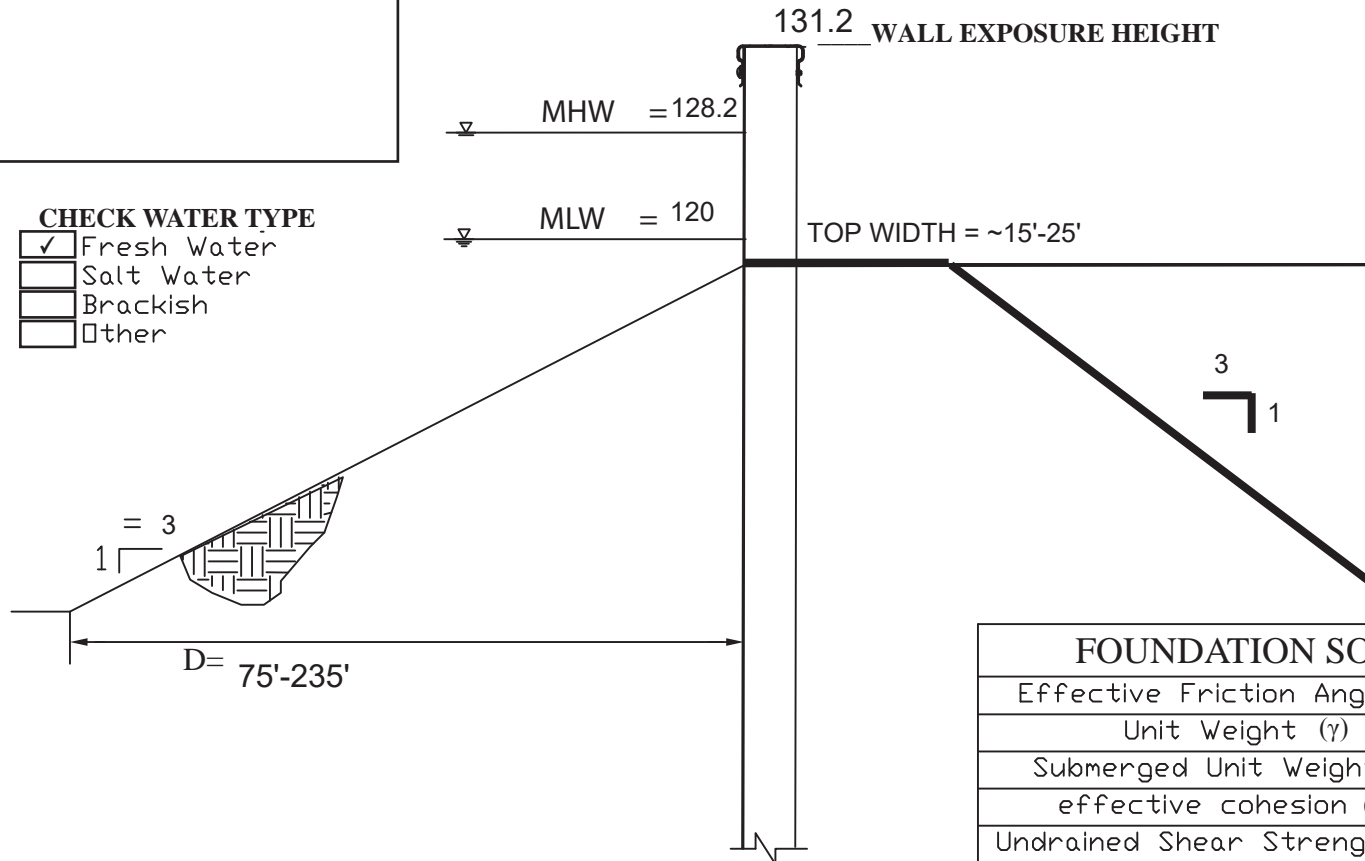
P: 770.850.4909  
F: 770.933.8363

info@cmilc.com  
[www.cmilc.com](http://www.cmilc.com)

FLOOD WALL - DESIGN REQUEST


NOTES: Floodplain section  
#197599.6

- CHECK WATER TYPE**
- Fresh Water
  - Salt Water
  - Brackish
  - Other



FOUNDATION SOIL: SELECT	
Effective Friction Angle ( $\theta'$ )	degrees
Unit Weight ( $\gamma$ )	pcf
Submerged Unit Weight ( $\gamma'$ )	pcf
effective cohesion ( $c'$ )	psf
Undrained Shear Strength ( $S_u$ )	psf
N value (SPT)	blows/ft

<b>PROJECT NAME</b>	Patuxent Greens
<b>STREET ADDRESS</b>	14415 Greenview Drive
<b>CITY, STATE</b>	Laurel, MD
<b>PHONE</b>	301-948-4700
<b>E-MAIL</b>	PHUGHES@RODGERS.com
<b>FAX</b>	N/A



1165 Northchase Pkwy SE,  
Suite 300, Marietta, GA 30067

P: 770.850.4909  
F: 770.933.8363

info@cmilc.com  
[www.cmilc.com](http://www.cmilc.com)

FLOOD WALL - DESIGN REQUEST

## **Appendix L**

### **Hec-Ras Output Data Files**

## **Hec-Ras Input and Output Data Files**

### **(Existing without Berm)**

# EXISTING WITHOUT BERM INPUT & OUTPUT DATA

PatuxentRiver.rep

HEC-RAS Version 4.1.0 Jan 2010  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```
X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X       X  X      X  X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X       X  X      X  X              X
X      X  X       X   X      X  X      X  X              X
X      X  XXXXXX   XXXX     X  X      X  X      XXXXX
```

## PROJECT DATA

Project Title: Patuxent River  
Project File : PatuxentRiver.prj  
Run Date and Time: 6/6/2019 7:39:50 AM

Project in English units

## Project Description:

Patuxent River - Anne Arundel County (Including the Laurel model) - Detailed Method

Vertical Datum: North American Vertical Datum 88 (NAVD88)

Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet

Geographic Coordinate System: North American 1983 Datum: North American 1983

Created by: Prince Georges County, MD in cooperation with USACE - Buffalo District as part of FEMA Map Modernization study for Anne Arundel County

GeoRAS Version: 4.2.92

ArcGIS Version: 9.2

## Reach Boundary

Conditions: Known WS Elevations from the 1985 FIS Report for Anne Arundel County.

PatuxentRiver.rep

\*\*\* This tributary was formerly known as Little Patuxent River  
Trib 2. The channel has been relocated to Dorsey Run. New ground data was  
provided for this model in CAD format. \*\*\*

PLAN DATA

Plan Title: Patuxent River - Multiple Run  
Plan File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06  
Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model without  
Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.p06

Geometry Title: Patuxent River  
Geometry File : n:\MD-Prince Georges\Patuxent Green\data  
transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model  
without Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.g01

Flow Title : 1985 FIS Flows  
Flow File : n:\MD-Prince Georges\Patuxent Green\data  
transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model  
without Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.f01

Plan Summary Information:

Number of:	Cross Sections = 226	Multiple Openings = 1
	Culverts = 0	Inline Structures = 0
	Bridges = 15	Lateral Structures = 0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 40
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA



PatuxentRiver.rep

Flow Title: 1985 FIS Flows

Flow File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06  
 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model without  
 Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.f01

Flow Data (cfs)

River	Reach	RS	10yr	50yr
100yr	500yr			
Patuxent River	1	216363.5	8277	15174
26258	41717			
Patuxent River	1	209431.5	8324	15174
26267	41717			
Patuxent River	1	200115.4	8893	15174
26361	41717			
Patuxent River	1	177708.1	8893	17000
26361	45000			
Patuxent River	1	127390.9	19000	35000
45000	70000			
Patuxent River	1	66861.67	24500	43000
52500	77000			

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Patuxent River	1	10yr	
Normal S = 0.0014			
Patuxent River	1	50yr	
Normal S = 0.0014			
Patuxent River	1	100yr	
Normal S = 0.0014			
Patuxent River	1	500yr	
Normal S = 0.0014			

GEOMETRY DATA

Geometry Title: Patuxent River

PatuxentRiver.rep

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =  
 Submerged Inlet + Outlet Cd = .8  
 Max Low Cord = 140.7

Additional Bridge Parameters

Add Friction component to Momentum  
 Do not add Weight component to Momentum  
 Class B flow critical depth computations use critical depth  
 inside the bridge at the upstream end  
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 201119

INPUT

Description: CH - D/S Bridge #14 - old section 119.2 (Laurel study)

Station Elevation Data		num=		163					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	156.23	24.93	157.24	59.82	156.77	144.57	156.95	174.48	155.91
229.32	155.56	259.23	148.84	284.16	145.36	309.08	145.6	343.98	144.01
418.76	143.38	433.72	141.72	453.66	143.79	498.52	143.39	543.39	140.37
563.33	140.14	588.26	141.46	608.2	140.11	628.14	142.01	643.09	145.48
653.07	146.23	668.02	142.62	682.98	145.58	692.95	146.42	702.92	144.84
712.89	146.04	722.86	143.35	732.83	142.98	752.77	139.09	767.77	145.39
832.76	145.07	882.76	143.37	902.76	143.41	962.75	141.75	977.75	142.34
1047.75	141.76	1082.75	140.7	1122.74	140.55	1152.74	139.23	1177.74	138.72
1237.73	139.34	1272.73	138.32	1312.73	138.41	1332.73	137.4	1347.73	138.4
1367.72	138.27	1382.72	136.93	1397.72	137.45	1432.72	135.8	1452.72	136.91
1492.72	133.44	1512.71	135.31	1527.71	135.06	1542.71	132.62	1587.71	129.61
1607.71	127.86	1702.7	127.91	1717.7	130.49	1732.7	130.14	1752.7	130.85
1772.7	130.19	1822.69	129.91	1852.69	129.01	1882.69	129.11	1927.68	128.56
1942.68	129.03	1977.68	128.62	1987.68	129.51	1997.68	128.24	2037.68	128.09
2062.67	128.68	2077.67	128.38	3067.62	130.11	3105	130.1	3203	129.8
3205	129.8	3323	129.6	3325	129.6	3341	129.03	3354	123.76
3371	121.95	3391	124.21	3392	127.3	3462	129.58	3465	129.21
3582	129.61	3584	129.64	3702	129.64	3704	129.42	3802	129.75

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3802.59	130.61	3842.59	131.04	3857.59	132.53	3882.59	140.16	3892.58	141.71
3922.58	141.77	3932.58	139.66	3952.58	131.89	3962.58	130.58	3997.58	128.99
4042.58	129.76	4057.58	131.17	4077.58	135.76	4092.57	136.73	4107.57	136.07
4147.57	137.73	4202.56	136.72	4212.56	137.39	4237.54	137.17	4267.42	135.98
4282.36	136.64	4302.28	136.18	4352.08	137.27	4367.02	136.9	4416.82	139.3
4441.72	139.19	4456.66	139.8	4501.48	138.97	4541.32	140.12	4581.16	139.35
4601.08	136.43	4611.04	137.04	4625.98	139.98	4650.88	140.99	4660.84	140.2
4670.8	137.76	4680.76	139.46	4690.72	138.58	4705.66	140.89	4720.6	139.43
4745.5	138.94	4770.4	141.08	4795.3	138.08	4805.26	140.48	4815.22	140.77
4825.18	139.13	4840.12	141.98	4865.02	142.4	4879.96	140.97	4894.9	137.13
4904.86	136.17	4929.76	139.09	4939.72	139.23	4964.62	136.82	4984.54	141.6
5004.46	140.74	5009.44	139.67	5024.38	141.71	5044.3	142.56	5123.98	143.1
5183.74	141.02	5203.66	141.11	5218.6	140.26	5243.5	140.09	5268.4	141.17
5343.1	141.48	5363.02	142.09	5387.92	141.68	5407.84	142.98	5427.76	142.39
5467.6	145.2	5496.25	145.22	5543.6	144.26				

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 3325 .03 3462 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 3325 3462 55.2 60.26 138.48 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 3055 134.3 F  
 3565 5543.6 134.3 T

Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 3935.67 4090.2 136.51

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	133.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.53	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	131.64	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	131.64	Flow Area (sq ft)	478.21	655.35
232.29				
E.G. Slope (ft/ft)	0.006059	Area (sq ft)	4182.05	655.35
747.25				
Q Total (cfs)	8324.00	Flow (cfs)	809.71	7052.29
462.00				
Top Width (ft)	2291.19	Top Width (ft)	1767.59	137.00
386.60				
Vel Total (ft/s)	6.09	Avg. Vel. (ft/s)	1.69	10.76

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1.99				
Max Chl Dpth (ft)	9.69	Hydr. Depth (ft)	1.77	4.78
2.26				
Conv. Total (cfs)	106934.9	Conv. (cfs)	10402.0	90597.8
5935.1				
Length Wtd. (ft)	61.35	Wetted Per. (ft)	270.00	140.55
103.02				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.67	1.76
0.85				
Alpha	2.65	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	10158.84	7818.18
16411.24				
C & E Loss (ft)	0.29	Cum SA (acres)	2425.54	703.18
3622.84				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	135.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	134.90	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	133.19	Flow Area (sq ft)	10037.50	1102.94
749.52				
E.G. Slope (ft/ft)	0.000469	Area (sq ft)	10037.50	1102.94
2044.88				
Q Total (cfs)	15174.00	Flow (cfs)	10136.77	4673.14
364.09				
Top Width (ft)	2369.22	Top Width (ft)	1828.85	137.00
403.37				

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Vel Total (ft/s) 0.49	1.28	Avg. Vel. (ft/s)	1.01	4.24
Max Chl Dpth (ft) 1.86	12.95	Hydr. Depth (ft)	5.49	8.05
Conv. Total (cfs) 16807.8	700494.6	Conv. (cfs)	467955.4	215731.4
Length Wtd. (ft) 404.29	58.62	Wetted Per. (ft)	1829.75	140.55
Min Ch El (ft) 0.05	121.95	Shear (lb/sq ft)	0.16	0.23
Alpha 0.00	3.82	Stream Power (lb/ft s)	5543.60	0.00
Frctn Loss (ft) 27274.48	0.07	Cum Volume (acre-ft)	18299.77	10342.07
C & E Loss (ft) 4113.11	0.41	Cum SA (acres)	2966.11	713.12

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	134.69	Element	Left OB	Channel
Vel Head (ft) 0.100	0.39	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 138.48	134.30	Reach Len. (ft)	55.20	60.26
Crit W.S. (ft) 506.63	134.30	Flow Area (sq ft)	8938.68	1020.24
E.G. Slope (ft/ft) 1801.98	0.002014	Area (sq ft)	8938.68	1020.24
Q Total (cfs) 394.05	26267.00	Flow (cfs)	17370.37	8502.58
Top Width (ft)	2350.12	Top Width (ft)	1811.73	137.00

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401.39				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.94	8.33
0.78				
Max Chl Dpth (ft)	12.35	Hydr. Depth (ft)	4.93	7.45
1.26				
Conv. Total (cfs)	585270.5	Conv. (cfs)	387039.3	189451.0
8780.1				
Length Wtd. (ft)	57.43	Wetted Per. (ft)	1812.52	140.55
402.22				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.62	0.91
0.16				
Alpha	3.97	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	23830.10	11528.81
35143.05				
C & E Loss (ft)	0.10	Cum SA (acres)	3294.14	712.92
4435.94				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	136.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	135.54	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.31	Flow Area (sq ft)	11208.20	1189.88
1006.18				
E.G. Slope (ft/ft)	0.002562	Area (sq ft)	11208.20	1189.88
2301.53				
Q Total (cfs)	41717.00	Flow (cfs)	27940.63	12391.54
1384.83				
Top Width (ft)	2398.92	Top Width (ft)	1856.47	137.00
405.45				
Vel Total (ft/s)	3.11	Avg. Vel. (ft/s)	2.49	10.41

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1.38				
Max Chl Dpth (ft)	13.59	Hydr. Depth (ft)	6.04	8.69
2.48				
Conv. Total (cfs)	824182.9	Conv. (cfs)	552009.6	244813.8
27359.5				
Length Wtd. (ft)	59.03	Wetted Per. (ft)	1857.43	140.55
406.46				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.97	1.35
0.40				
Alpha	3.76	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	34714.03	13697.62
49714.71				
C & E Loss (ft)	0.15	Cum SA (acres)	3701.46	714.79
5031.19				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 201058.7

INPUT

Description: old section 119.1 (Laurel study)

Station Elevation Data		num=		171					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	147.89	59.96	146.91	94.93	147.39	129.91	146.92	169.88	145.98
189.87	145.16	204.86	142.09	209.85	143.47	224.84	145.23	244.83	144.25
279.8	144.51	294.79	144.02	309.78	144.64	344.76	142.98	364.75	142.39
379.74	143.17	409.71	141.75	419.71	142.21	434.7	141.49	449.69	142.04
469.67	140.4	489.66	140.84	499.65	140.2	514.64	141.63	589.59	138.54
609.58	139.31	634.56	139.17	649.55	138.38	669.53	138.97	689.52	138.03
699.51	138.77	719.5	138.93	739.48	138.28	769.46	138.29	779.46	137.4
809.44	137.67	859.4	136.94	864.4	137.43	879.39	135.24	904.37	133.95
939.35	132.95	989.31	132.17	1029.28	130.45	1054.27	128.56	1069.25	130.66
1089.24	130.52	1114.22	128.35	1129.21	127.86	1164.19	127.95	1199.16	130.15
1209.16	130.2	1254.12	131.94	1274.11	131.13	1354.05	129.64	1389.03	127.22
1399.02	128.19	1424	128.6	1438.99	127.71	1453.98	127.81	1468.97	126.94
1493.95	128.53	1513.94	127.34	1523.93	127.96	1543.92	126.4	1568.9	126.19
2423.3	127.19	2433.29	127.51	2498.24	127.54	2578.19	128.6	2618.16	128.43
2648.13	128.63	2663.12	129.2	2678.11	128.65	2698.1	128.74	2708.09	129.78
2723.08	129.53	2738.07	130.28	2748.06	129.55	2763.05	130.01	2773	129.46
2780	123.53	2805	122.96	2831	123.15	2833	127.89	2850.37	131.41
2864.99	134.79	2879.87	135.8	2914.6	136.47	2924.52	137.7	2934.44	136.97
2954.29	137.98	2964.21	137.5	2979.09	135.27	3003.89	140.21	3048.54	140.74
3058.46	140.58	3088.22	141.51	3103.11	141	3127.91	141.61	3137.83	141.13

PatuxentRiver.rep

3172.56	141.75	3192.4	141.25	3207.28	141.54	3237.04	140.41	3251.93	139.43
3271.77	139.11	3301.53	136.31	3321.38	135.3	3341.22	133.09	3366.02	131.26
3380.9	128.73	3390.83	128.18	3425.62	128.77	3445.56	127.41	3465.49	127.31
3495.4	128.43	3520.32	127.43	3535.27	128.91	3555.21	130.05	3575.15	130.45
3580	131.2	3581	149.2	3729	149.2	3730	136.2	3759.56	134.46
3774.51	135.31	3789.46	133.34	3804.42	136.42	3844.29	135.43	3864.22	135.93
3879.18	135.34	3904.1	135.36	3934	135.88	3953.94	137.31	3988.83	137.76
4013.75	134.93	4023.72	136	4038.67	134.01	4048.64	135.94	4068.57	132.04
4103.46	133.08	4143.33	131.37	4158.29	132.01	4178.22	131.52	4188.19	132.13
4233.04	131.94	4352.66	132.01	4407.48	133.85	4447.35	135.7	4467.29	134.46
4482.24	135.62	4532.08	136.12	4542.04	135.84	4561.98	137.51	4566.96	136.8
4576.93	137.91	4611.82	138.56	4626.77	139.45	4700	141.2	4701	149.2
4789	149.2	4790	141.2	4796.22	139.61	4811.17	138.48	4856.03	139.71
4889.42	140.1	4920.64	139.79	4956.02	141.14	4980.73	140.9	4990.61	139.96
5020.26	140.32								

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1	2773 .035	2833 .1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
2773	2833	508.58	943.33	306.29	.1	.3	
Ineffective Flow	num=	2					
Sta L	Sta R	Elev	Permanent				
0	2300	133.7	F				
2935	5020.26	133.7	T				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	132.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.56	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	130.88	Flow Area (sq ft)	1616.86	476.47
33.20				
E.G. Slope (ft/ft)	0.004018	Area (sq ft)	6621.22	476.47
671.45				
Q Total (cfs)	8324.00	Flow (cfs)	3455.09	4822.52
46.38				
Top Width (ft)	2057.32	Top Width (ft)	1750.23	60.00
247.09				
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.14	10.12
1.40				
Max Chl Dpth (ft)	8.60	Hydr. Depth (ft)	3.42	7.94
1.84				



PatuxentRiver.rep

Conv. Total (cfs) 731.7	131316.1	Conv. (cfs)	54506.2	76078.2
Length Wtd. (ft) 18.38	688.35	Wetted Per. (ft)	473.16	65.33
Min Ch El (ft) 0.45	122.96	Shear (lb/sq ft)	0.86	1.83
Alpha 0.00	4.00	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 16408.99	2.13	Cum Volume (acre-ft)	10152.00	7817.40
C & E Loss (ft) 3621.83	0.22	Cum SA (acres)	2423.31	703.05

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	134.52	Element	Left OB	Channel
Vel Head (ft) 0.100	1.48	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	133.04	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 64.73	132.41	Flow Area (sq ft)	2319.30	565.57
E.G. Slope (ft/ft) 1339.98	0.005615	Area (sq ft)	9286.43	565.57
Q Total (cfs) 135.97	15174.00	Flow (cfs)	7451.80	7586.24
Top Width (ft) 580.66	2477.60	Top Width (ft)	1836.93	60.00
Vel Total (ft/s) 2.10	5.14	Avg. Vel. (ft/s)	3.21	13.41
Max Chl Dpth (ft) 2.65	10.08	Hydr. Depth (ft)	4.90	9.43
Conv. Total (cfs) 1814.5	202499.3	Conv. (cfs)	99445.4	101239.5
Length Wtd. (ft)	665.02	Wetted Per. (ft)	473.16	65.33

PatuxentRiver.rep

24.98				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	1.72	3.03
0.91				
Alpha	3.59	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	2.65	Cum Volume (acre-ft)	18287.52	10340.92
27269.10				
C & E Loss (ft)	0.35	Cum SA (acres)	2963.79	712.98
4111.54				

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	134.38	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.19	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	133.70	Flow Area (sq ft)	11408.21	634.14
386.75				
E.G. Slope (ft/ft)	0.001435	Area (sq ft)	11408.21	634.14
2041.86				
Q Total (cfs)	26267.00	Flow (cfs)	21410.09	4641.53
215.37				
Top Width (ft)	2581.30	Top Width (ft)	1873.21	60.00
648.09				
Vel Total (ft/s)	2.11	Avg. Vel. (ft/s)	1.88	7.32
0.56				
Max Chl Dpth (ft)	11.23	Hydr. Depth (ft)	6.09	10.57
0.60				
Conv. Total (cfs)	693317.6	Conv. (cfs)	565119.4	122513.3
5684.8				
Length Wtd. (ft)	578.96	Wetted Per. (ft)	1874.24	65.33
652.71				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	0.55	0.87
0.05				

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Alpha 0.00	2.76	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 35136.94	1.04	Cum Volume (acre-ft)	23817.21	11527.67
C & E Loss (ft) 4434.27	0.01	Cum SA (acres)	3291.80	712.79

Warning: Divided flow computed for this cross-section.  
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	135.83	Element	Left OB	Channel
Vel Head (ft) 0.100	0.27	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	135.56	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 1380.52	133.70	Flow Area (sq ft)	13994.19	716.41
E.G. Slope (ft/ft) 3044.27	0.001856	Area (sq ft)	13994.19	716.41
Q Total (cfs) 1301.98	41717.00	Flow (cfs)	33947.58	6467.44
Top Width (ft) 878.49	2834.28	Top Width (ft)	1895.79	60.00
Vel Total (ft/s) 0.94	2.59	Avg. Vel. (ft/s)	2.43	9.03
Max Chl Dpth (ft) 1.57	12.60	Hydr. Depth (ft)	7.38	11.94
Conv. Total (cfs) 30223.5	968399.8	Conv. (cfs)	788044.0	150132.3
Length Wtd. (ft) 885.44	557.83	Wetted Per. (ft)	1896.86	65.33
Min Ch El (ft) 0.18	122.96	Shear (lb/sq ft)	0.85	1.27
Alpha 0.00	2.60	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 49706.21	1.25	Cum Volume (acre-ft)	34698.06	13696.30
C & E Loss (ft) 5029.15	0.00	Cum SA (acres)	3699.09	714.65

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 200115.4

INPUT

Description: old section 118 (Laurel study)

Station Elevation Data		num= 203									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148.03	24.97	148.06	39.96	147.25	89.9	147.57	139.85	146.64		
169.82	146.95	194.79	148.02	239.74	146.73	274.71	145.45	304.67	144.82		
339.64	145.33	349.63	144.86	359.62	143.06	374.6	143.85	399.57	144.05		
444.52	142.92	484.48	143.44	534.43	143.04	549.41	142.38	589.37	142.63		
624.33	142.11	639.32	142.7	669.28	142.19	709.24	139.52	754.19	137.8		
769.18	136.89	809.13	132.81	864.07	129.41	894.04	129.03	914.02	128.04		
929	127.91	958.97	125.98	983.94	125.62	1028.9	125.62	1053.87	129.28		
1078.84	129.79	1093.83	130.75	1118.8	130.44	1128.79	130.9	1188.72	131.69		
1233.68	131.03	1278.63	129.1	1323.58	128.37	1358.54	126.74	1393.5	126.87		
1413.48	126.49	1438.46	125.28	1468.42	124.59	1503.39	124.88	1523.36	124.57		
1558.33	125.22	1593.29	124.58	1608.27	125.18	1743.13	125.13	1788.08	125.61		
1863	125.51	1887.97	126.04	1917.94	125.63	1972.88	126.12	2017.83	126.19		
2062.78	126.62	2077.77	126.49	2107.74	127.04	2117.73	126.51	2132.71	127.2		
2162.68	127.39	2187.65	128.21	2207.63	127.89	2237.6	128.72	2267.56	127.72		
2282.55	128.56	2317.48	128.41	2327.44	128.9	2339	128.9	2344	122.06		
2360	122.31	2374	122.74	2378	124.57	2389	124.85	2396	129.51		
2407.17	129.18	2422.08	127.58	2451.92	128.1	2471.81	132.14	2496.67	132.6		
2526.5	135.4	2541.42	137.62	2556.33	136.96	2586.17	137.57	2601.08	137.27		
2630.91	138.24	2650.8	139.31	2680.64	139.59	2700.53	141.48	2710.47	141.71		
2725.39	143.56	2755.22	142.03	2829.8	143.57	2864.61	143.31	2899.41	144.3		
2969.02	145.01	3028.69	144.14	3043.6	144.68	3058.52	144	3098.3	143.62		
3133.1	142.81	3172.94	140.39	3197.87	140.66	3207.85	140.24	3217.82	138.35		
3237.77	131.58	3247.74	129.45	3267.69	127.62	3287.64	126.5	3312.57	126.52		
3392.36	125.49	3407.32	125.8	3427.27	124.89	3447.21	126.37	3467.16	125.89		
3497.08	125.99	3517.03	126.83	3571.89	126.39	3601.81	127.08	3616.77	126.75		
3636.71	127.44	3681.59	127.33	3691.57	126.64	3711.52	127.81	3756.4	127.53		
3826.21	125.95	3836.19	126.26	3871.09	125.73	3965.84	125.76	4005.74	127.25		
4020.7	127.03	4045.63	129.79	4055.61	130.12	4080.54	126.23	4110.46	124.63		
4175.29	124.86	4220.17	123.76	4265.05	124.01	4285	123.55	4314.92	123.47		
4334.87	124.18	4349.83	125.69	4369.78	131.94	4374.76	132.82	4404.68	133.83		
4424.63	133.99	4494.45	133.45	4634.08	131.65	4673.97	132.01	4748.77	131.89		

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4793.65	132.89	4813.6	132.73	4828.56	133.61	4843.52	133.48	4858.48	131.93
4883.42	133.14	4913.34	132.99	4942.56	131.82	5035.47	132.79	5051.63	133.33
5075.87	133.09	5090	133.2	5091	149.2	5259	149.2	5260	133.2
5276.36	132.51	5291.3	131.9	5316.21	132.11	5326.17	132.8	5356.06	133.53
5375.99	133.35	5390.93	132.54	5420.82	132.61	5445.73	131.75	5490.56	132.02
5510.49	131.13	5525.43	131.86	5535.39	131.31	5555.32	128.79	5565.28	130.7
5575.25	130.98	5585.21	129.47	5620.08	126.39	5635.02	127.4	5649.97	125.24
5664.91	121.75	5669.89	115.42	5674.88	120.84	5699.78	127.99	5709.75	129.97
5724.69	129.91	5749.6	132.97	5759.56	132.52	5784.47	138.37	5799.39	139.66
5824.2	138.26	5844.04	137.93	5868.84	138.65				

Manning's n Values

num=	3
Sta n Val	Sta n Val
0 .1	2339 .035
	2396 .1

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
2339	2396	1501.45	1527.39	1537.6	.1 .3
Ineffective Flow	num=	2			
Sta L	Sta R	Elev	Permanent		
0	1400	132.4	F		
2720	5868.84	132.4	T		

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	130.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.22	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	129.94	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3566.72	352.21
100.94				
E.G. Slope (ft/ft)	0.002483	Area (sq ft)	4383.81	352.21
4909.48				
Q Total (cfs)	8893.00	Flow (cfs)	6428.25	2364.79
99.95				
Top Width (ft)	2689.44	Top Width (ft)	1305.64	57.00
1326.80				
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.71
0.99				
Max Chl Dpth (ft)	14.52	Hydr. Depth (ft)	3.80	6.18
1.55				
Conv. Total (cfs)	178467.8	Conv. (cfs)	129004.4	47457.5
2005.9				
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29
65.26				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.59	0.88

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0.24 Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00
0.00 Frctn Loss (ft)	2.95	Cum Volume (acre-ft)	10087.75	7808.42
16389.37 C & E Loss (ft)	0.04	Cum SA (acres)	2405.48	701.78
3616.30				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	131.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.32	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.20	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	129.18	Flow Area (sq ft)	4749.65	424.02
186.71				
E.G. Slope (ft/ft)	0.002983	Area (sq ft)	6095.22	424.02
6633.13				
Q Total (cfs)	15174.00	Flow (cfs)	11355.89	3531.04
287.07				
Top Width (ft)	2891.36	Top Width (ft)	1433.35	57.00
1401.00				
Vel Total (ft/s)	2.83	Avg. Vel. (ft/s)	2.39	8.33
1.54				
Max Chl Dpth (ft)	15.78	Hydr. Depth (ft)	5.06	7.44
2.62				
Conv. Total (cfs)	277846.7	Conv. (cfs)	207934.4	64655.9
5256.4				
Length Wtd. (ft)	1518.75	Wetted Per. (ft)	939.20	62.29
71.59				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.94	1.27
0.49				
Alpha	2.55	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.22	Cum Volume (acre-ft)	18197.73	10330.20
27241.07				

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C & E Loss (ft)	0.06	Cum SA (acres)	2944.70	711.71
4104.58				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	133.33	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.26	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	133.07	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	130.23	Flow Area (sq ft)	8916.17	530.53
1587.42				
E.G. Slope (ft/ft)	0.002324	Area (sq ft)	8916.17	530.53
9875.15				
Q Total (cfs)	26361.00	Flow (cfs)	20652.77	4528.05
1180.18				
Top Width (ft)	3774.68	Top Width (ft)	1532.41	57.00
2185.27				
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)	2.32	8.53
0.74				
Max Chl Dpth (ft)	17.65	Hydr. Depth (ft)	5.82	9.31
0.73				
Conv. Total (cfs)	546854.1	Conv. (cfs)	428438.0	93933.5
24482.6				
Length Wtd. (ft)	1517.53	Wetted Per. (ft)	1533.23	62.29
2196.67				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.84	1.24
0.10				
Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.34	Cum Volume (acre-ft)	23698.56	11515.05
35095.04				
C & E Loss (ft)	0.03	Cum SA (acres)	3271.92	711.52
4424.31				

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Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	134.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.32	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.26	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	131.43	Flow Area (sq ft)	10740.78	598.14
4405.06				
E.G. Slope (ft/ft)	0.002750	Area (sq ft)	10740.78	598.14
12705.15				
Q Total (cfs)	41717.00	Flow (cfs)	30487.38	6016.05
5213.56				
Top Width (ft)	4086.52	Top Width (ft)	1544.02	57.00
2485.50				
Vel Total (ft/s)	2.65	Avg. Vel. (ft/s)	2.84	10.06
1.18				
Max Chl Dpth (ft)	18.84	Hydr. Depth (ft)	6.96	10.49
1.77				
Conv. Total (cfs)	795512.3	Conv. (cfs)	581371.8	114721.6
99418.8				
Length Wtd. (ft)	1519.32	Wetted Per. (ft)	1544.90	62.29
2499.35				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	1.19	1.65
0.30				
Alpha	2.94	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.51	Cum Volume (acre-ft)	34553.66	13682.07
49650.84				
C & E Loss (ft)	0.05	Cum SA (acres)	3679.01	713.39
5017.32				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth



with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 198588.0

INPUT

Description: old section 117 (Laurel study)

Station Elevation Data num= 200

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	149.39	14.97	148	64.89	145.63	99.82	142.72	134.76	140.73
149.74	139.54	209.63	136.68	234.59	134.78	249.56	134.78	279.51	133.2
334.41	131.91	349.39	131.86	399.3	130.84	429.24	129.61	464.18	129.63
514.1	128.49	569	127.87	603.94	126.44	633.88	126.25	653.85	125.34
713.74	124.75	733.71	125.18	758.66	124.74	798.59	124.71	858.49	124.12
883.45	123.45	888.44	123.87	948.33	123.7	968.3	123.25	1003.23	124.28
1033.18	123.7	1078.1	124.71	1093.08	124.26	1113.04	124.95	1147.98	125.37
1157.96	124.94	1172.94	125.76	1192.9	125.36	1227.84	125.81	1247.8	126.59
1267.46	126.18	1275	125.76	1285	120.1	1300	119.57	1313	120.29
1325	126.09	1350.14	127.02	1380.01	126.12	1389.97	126.46	1419.84	126.23
1464.65	127.02	1474.61	126.48	1499.51	126.45	1514.44	127.05	1544.32	126.96
1549.3	126.32	1564.23	127.1	1579.17	126.26	1589.13	127.38	1609.04	126.35
1633.94	126.87	1648.87	127.74	1663.81	126.71	1683.73	126.34	1693.68	127.19
1718.58	127.02	1733.51	126.39	1828.11	125.52	1867.94	124.19	1937.65	124.37
1972.5	124.83	1997.4	123.46	2017.31	125.08	2047.18	125.39	2091.99	124.82
2116.89	125.31	2156.72	125	2181.62	125.26	2251.32	125.13	2321.03	123.98
2345.92	124.5	2375.8	124.47	2400.69	123.4	2425.59	124.43	2445.5	123.86
2490.33	124.3	2520.31	124.13	2555.28	123.31	2585.25	124.92	2625.22	124.61
2640.21	124.08	2665.19	124.53	2680.17	123.93	2725.14	123.82	2750.12	123.49
2775.1	124.15	2810.07	123.69	2845.04	124.13	2860.02	125.16	2870.02	124.27
2899.99	124.69	2909.98	124.15	2929.97	124.72	2949.95	124.2	2969.93	125.05
2984.92	124.21	3004.9	121.61	3034.88	124.47	3054.86	124.44	3064.85	125.23
3079.84	123.64	3104.82	124.58	3129.8	123.7	3144.79	125.46	3154.78	125.63
3169.77	124.3	3194.75	123.68	3224.72	123.88	3279.68	123.48	3309.65	124.02
3339.63	123.04	3459.53	123.07	3504.49	123.37	3529.47	124.59	3589.42	124.34
3609.4	124.54	3619.39	123.9	3639.38	124.65	3729.3	123.7	3759.28	125.54
3799.24	124.92	3849.2	125.33	3899.16	123.92	3934.13	125.59	3954.12	122.97
3969.1	125.15	3979.1	125.78	4004.07	125.29	4029.05	122.85	4039.05	122.62
4103.99	125.79	4138.96	125.11	4163.94	124.16	4223.9	124.02	4243.88	123.24
4253.87	123.84	4273.86	123.8	4313.83	122.61	4333.81	123.27	4358.79	123.37
4418.75	122.28	4438.73	123.01	4468.71	123.15	4498.68	122.56	4523.66	122.84
4558.64	122.11	4588.61	122.75	4658.56	121.92	4683.54	122.35	4726.94	122.06
4761.66	122.24	4805.07	121.91	4822.43	121.07	4848.47	121.93	4900.56	122.17
4930.94	121.6	4956.98	122.23	4974.34	122.1	5017.74	122.9	5043.79	122.76
5056.81	123.41	5087.77	122.18	5097.63	122.61	5107.48	121.63	5132.11	121.98
5137.03	121.07	5146.88	115.92	5151.81	118.44	5171.51	125.54	5186.29	126.76

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5205.99	122.49	5215.85	121.38	5230.62	122.11	5245.4	121.89	5265.1	120.06
5284.81	125.95	5294.7	126.51	5344.18	126	5354.07	126.41	5393.66	129.67
5428.29	127.98	5438.19	128.08	5453.03	129.46	5477.77	130.22	5512.4	133.01
5542.09	134.48	5576.72	133.9	5611.36	134.33	5690.52	137.63	5710.31	138.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1275	.035	1325	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1275	1325		993.28	988.41		.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
3300	5710.31	129.4	T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	127.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.09	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	127.08	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	1548.97	289.58
4290.31				
E.G. Slope (ft/ft)	0.001564	Area (sq ft)	1548.97	289.58
11861.14				
Q Total (cfs)	8893.00	Flow (cfs)	1565.54	1511.20
5816.26				
Top Width (ft)	4725.06	Top Width (ft)	686.59	50.00
3988.47				
Vel Total (ft/s)	1.45	Avg. Vel. (ft/s)	1.01	5.22
1.36				
Max Chl Dpth (ft)	11.16	Hydr. Depth (ft)	2.26	5.79
2.23				
Conv. Total (cfs)	224854.8	Conv. (cfs)	39583.8	38209.9
147061.1				
Length Wtd. (ft)	949.97	Wetted Per. (ft)	686.79	52.85
1927.71				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.22	0.54
0.22				
Alpha	2.85	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.15	Cum Volume (acre-ft)	9985.51	7797.17
16093.38				
C & E Loss (ft)	0.01	Cum SA (acres)	2371.14	699.90
3522.49				

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Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	128.23	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	128.13	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	2289.33	342.34
6365.25				
E.G. Slope (ft/ft)	0.001584	Area (sq ft)	2289.33	342.34
16120.34				
Q Total (cfs)	15174.00	Flow (cfs)	2902.49	2010.06
10261.44				
Top Width (ft)	4842.59	Top Width (ft)	729.09	50.00
4063.50				
Vel Total (ft/s)	1.69	Avg. Vel. (ft/s)	1.27	5.87
1.61				
Max Chl Dpth (ft)	12.21	Hydr. Depth (ft)	3.14	6.85
3.22				
Conv. Total (cfs)	381268.8	Conv. (cfs)	72929.3	50505.8
257833.7				
Length Wtd. (ft)	948.93	Wetted Per. (ft)	729.31	52.85
1976.46				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.31	0.64
0.32				
Alpha	2.33	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.30	Cum Volume (acre-ft)	18053.23	10316.77
26839.49				
C & E Loss (ft)	0.01	Cum SA (acres)	2907.43	709.84
4008.13				

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

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CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	129.96	Element	Left OB	Channel
Vel Head (ft) 0.080	0.16	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 937.73	129.80	Reach Len. (ft)	993.28	988.41
Crit W.S. (ft) 10530.34		Flow Area (sq ft)	3600.56	425.99
E.G. Slope (ft/ft) 22980.06	0.002089	Area (sq ft)	3600.56	425.99
Q Total (cfs) 16639.64	26361.00	Flow (cfs)	6398.26	3323.10
Top Width (ft) 4139.22	5039.69	Top Width (ft)	850.47	50.00
Vel Total (ft/s) 1.58	1.81	Avg. Vel. (ft/s)	1.78	7.80
Max Chl Dpth (ft) 2.54	13.88	Hydr. Depth (ft)	4.23	8.52
Conv. Total (cfs) 364058.7	576752.4	Conv. (cfs)	139987.5	72706.2
Length Wtd. (ft) 4146.74	949.94	Wetted Per. (ft)	850.72	52.85
Min Ch El (ft) 0.33	119.57	Shear (lb/sq ft)	0.55	1.05
Alpha 0.00	3.05	Stream Power (lb/ft s)	5710.31	0.00
Frctn Loss (ft) 34515.18	1.68	Cum Volume (acre-ft)	23482.85	11498.29
C & E Loss (ft) 4312.69	0.02	Cum SA (acres)	3230.86	709.64

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	131.02	Element	Left OB	Channel
Vel Head (ft) 0.080	0.15	Wt. n-Val.	0.100	0.035

PatuxentRiver.rep

W.S. Elev (ft) 937.73	130.87	Reach Len. (ft)	993.28	988.41
Crit W.S. (ft) 14957.48		Flow Area (sq ft)	4521.11	479.29
E.G. Slope (ft/ft) 27407.20	0.001969	Area (sq ft)	4521.11	479.29
Q Total (cfs) 28896.26	41717.00	Flow (cfs)	8893.71	3927.02
Top Width (ft) 4160.84	5087.99	Top Width (ft)	877.16	50.00
Vel Total (ft/s) 1.93	2.09	Avg. Vel. (ft/s)	1.97	8.19
Max Chl Dpth (ft) 3.59	14.95	Hydr. Depth (ft)	5.15	9.59
Conv. Total (cfs) 651163.6	940072.9	Conv. (cfs)	200415.6	88493.6
Length Wtd. (ft) 4168.39	947.95	Wetted Per. (ft)	877.42	52.85
Min Ch El (ft) 0.44	119.57	Shear (lb/sq ft)	0.63	1.11
Alpha 0.00	2.23	Stream Power (lb/ft s)	5710.31	0.00
Frctn Loss (ft) 48942.89	1.58	Cum Volume (acre-ft)	34290.64	13663.18
C & E Loss (ft) 4900.02	0.01	Cum SA (acres)	3637.28	711.51

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 197599.6

INPUT

Description: old section 116 (Laurel study)

Station Elevation Data num= 200

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.54	9.98	138.69	29.95	137.94	64.89	135.54	74.87	135.17
99.82	135.02	119.79	135.47	159.72	133.91	169.7	132.9	189.67	132.97
219.61	131.84	244.57	131.51	314.45	129.86	369.35	129.59	384.32	129.26
414.27	129.22	434.24	128.76	444.22	129.07	469.17	128.37	524.08	128.65
578.98	127.48	608.93	128.1	643.87	128.5	693.78	130.24	713.74	130

PatuxentRiver.rep

743.69	130.86	758.66	131.69	773.64	131.54	818.56	131.77	838.52	132.09
848.51	131.75	863.48	133.73	873.46	134.14	883.44	133.24	905	126.93
945	124.89	954	121.64	963	120.9	967	119.69	980	117.91
991	118.52	1000	125.86	1028.19	124.94	1058.14	124.73	1068.12	124.28
1083.09	124.53	1103.06	123.82	1118.03	124.7	1152.97	123.36	1177.93	123.52
1202.88	123.1	1232.83	123.23	1272.76	123.04	1337.64	123.22	1417.5	122.71
1502.35	122.98	1567.24	123	1612.16	122.51	1672.06	122.97	1751.92	122.84
1771.88	122.56	1806.82	122.48	1841.76	122.02	1881.69	121.89	1926.61	122.32
1941.58	122.65	1991.49	121.85	2041.41	122.51	2086.33	122.1	2121.26	122.36
2151.21	122	2166.19	121.15	2196.13	121.68	2216.1	122.64	2246.05	123.18
2271.01	123.19	2280.99	122.87	2345.91	124.06	2390.85	123.77	2410.83	123.8
2440.79	124.24	2495.72	123.2	2545.66	123.73	2585.61	123.18	2600.59	123.28
2625.56	122.81	2660.51	123.68	2685.48	124.02	2705.45	123.97	2715.44	122.85
2730.42	123.58	2740.41	122.81	2750.4	123.42	2760.38	123.3	2775.36	123.86
2790.35	123.43	2805.33	124.57	2810.32	124.12	2830.3	120.2	2835.29	120.38
2855.26	123.56	2870.24	123.17	2885.23	124.25	2925.17	123.87	2955.14	124.73
2980.1	124.2	3025.05	122.18	3035.03	122.02	3109.94	122.07	3134.91	122.72
3154.88	122.59	3194.83	122.91	3254.76	122.65	3274.73	123.3	3299.7	123.62
3319.67	123.2	3329.66	123.6	3349.64	123.58	3399.57	122.47	3454.5	122.77
3509.43	121.92	3524.41	121.06	3544.39	121.12	3574.35	122.26	3589.33	121.31
3604.31	123.23	3614.3	123.65	3669.23	122.99	3684.21	121.73	3704.18	121.1
3784.08	121.08	3804.06	122.1	3834.02	121.54	3849	122.39	3873.97	122.13
3903.93	123.18	3948.87	122.71	3973.84	122.77	4003.8	122.36	4053.74	122.01
4072.68	122.13	4123.8	121.34	4142.39	121.5	4151.68	121.04	4179.57	121.35
4235.34	121.31	4292.66	120.32	4302.58	120.81	4322.42	121.02	4342.25	119.66
4362.09	119.14	4381.93	119.17	4391.84	120.2	4411.68	120.77	4431.52	120.78
4451.35	118.36	4456.31	115.62	4476.15	120.11	4491.02	124.76	4500.94	126.53
4505.9	126.68	4525.74	125.67	4550.53	122.94	4580.29	121.32	4605.11	120.49
4620.08	121.3	4635.04	120.27	4669.96	119.1	4689.92	117.72	4784.71	117.73
4809.65	117.72	4849.56	117.88	4869.52	118.61	4884.48	118.45	4904.44	118.8
4934.37	122.13	4969.29	123.67	5034.14	125.08	5074.05	125.14	5089.02	125.68
5113.96	125.53	5128.93	126.29	5153.88	126.73	5168.84	128.87	5178.82	129.47
5188.8	128.42	5203.76	129.61	5213.74	129.09	5223.72	130.23	5238.68	130.13
5263.63	130.48	5278.59	130.19	5308.53	131.4	5348.44	130.58	5373.38	131.33
5413.29	130.67	5428.26	131.19	5438.23	132.72	5458.19	131.48	5478.15	131.05

Manning's n Values	num=	6							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.04	578.98	.1	963	.035	1000	.08	4431.52	.035
5034.14	.05								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	963	1000		1000.4	1030.79		.1	.3
Ineffective Flow		num=	1					
Sta L	Sta R	Elev	Permanent					
3300	5478.15	127.1	T					

CROSS SECTION OUTPUT Profile #10yr

PatuxentRiver.rep

E.G. Elev (ft) Right OB	126.01	Element	Left OB	Channel
Vel Head (ft) 0.080	0.05	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 1005.50	125.95	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 6668.97		Flow Area (sq ft)	77.45	234.63
E.G. Slope (ft/ft) 14642.45	0.000967	Area (sq ft)	77.45	234.63
Q Total (cfs) 7828.42	8893.00	Flow (cfs)	56.06	1008.51
Top Width (ft) 4099.85	4175.71	Top Width (ft)	38.86	37.00
Vel Total (ft/s) 1.17	1.27	Avg. Vel. (ft/s)	0.72	4.30
Max Chl Dpth (ft) 2.90	10.33	Hydr. Depth (ft)	1.99	6.34
Conv. Total (cfs) 251785.3	286025.2	Conv. (cfs)	1803.2	32436.7
Length Wtd. (ft) 2301.22	1011.57	Wetted Per. (ft)	39.48	39.93
Min Ch El (ft) 0.17	117.91	Shear (lb/sq ft)	0.12	0.35
Alpha 0.00	2.04	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 15808.10	1.81	Cum Volume (acre-ft)	9966.96	7791.23
C & E Loss (ft) 3435.43	0.05	Cum SA (acres)	2362.87	698.92

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	126.92	Element	Left OB	Channel
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PatuxentRiver.rep				
Vel Head (ft) 0.080	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 1005.50	126.85	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 8723.28		Flow Area (sq ft)	119.97	267.68
E.G. Slope (ft/ft) 18328.33	0.001204	Area (sq ft)	119.97	267.68
Q Total (cfs) 13670.27	15174.00	Flow (cfs)	101.59	1402.15
Top Width (ft) 4154.70	4248.07	Top Width (ft)	56.37	37.00
Vel Total (ft/s) 1.57	1.67	Avg. Vel. (ft/s)	0.85	5.24
Max Chl Dpth (ft) 3.79	11.23	Hydr. Depth (ft)	2.13	7.23
Conv. Total (cfs) 393912.3	437242.7	Conv. (cfs)	2927.2	40403.3
Length Wtd. (ft) 2301.22	1009.82	Wetted Per. (ft)	57.02	39.93
Min Ch El (ft) 0.29	117.91	Shear (lb/sq ft)	0.16	0.50
Alpha 0.00	1.71	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 26468.70	2.02	Cum Volume (acre-ft)	18025.76	10309.85
C & E Loss (ft) 3919.67	0.03	Cum SA (acres)	2898.47	708.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

#### CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	128.27	Element	Left OB	Channel
Vel Head (ft) 0.078	0.10	Wt. n-Val.	0.098	0.035
W.S. Elev (ft) 1005.50	128.17	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft)		Flow Area (sq ft)	222.18	316.68



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13761.44				
E.G. Slope (ft/ft)	0.001512	Area (sq ft)	222.18	316.68
23836.12				
Q Total (cfs)	26361.00	Flow (cfs)	259.15	2078.78
24023.07				
Top Width (ft)	4331.79	Top Width (ft)	130.83	37.00
4163.95				
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	1.17	6.56
1.75				
Max Chl Dpth (ft)	12.55	Hydr. Depth (ft)	1.70	8.56
3.30				
Conv. Total (cfs)	678007.5	Conv. (cfs)	6665.5	53466.4
617875.7				
Length Wtd. (ft)	1008.63	Wetted Per. (ft)	131.67	39.93
4168.69				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.16	0.75
0.31				
Alpha	1.82	Stream Power (lb/ft s)	5478.15	0.00
0.00				
Frctn Loss (ft)	2.16	Cum Volume (acre-ft)	23439.26	11489.86
34011.26				
C & E Loss (ft)	0.02	Cum SA (acres)	3219.67	708.66
4223.32				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	129.43	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.084	0.035
0.075				
W.S. Elev (ft)	129.32	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)		Flow Area (sq ft)	504.77	359.09
18549.96				
E.G. Slope (ft/ft)	0.001434	Area (sq ft)	504.77	359.09
28624.63				
Q Total (cfs)	41717.00	Flow (cfs)	601.74	2496.64

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38618.62					
Top Width (ft)	4591.21	Top Width (ft)	351.76	37.00	
4202.45					
Vel Total (ft/s)	2.15	Avg. Vel. (ft/s)	1.19	6.95	
2.08					
Max Chl Dpth (ft)	13.70	Hydr. Depth (ft)	1.43	9.71	
4.41					
Conv. Total (cfs)	1101591.0	Conv. (cfs)	15889.6	65926.9	
1019774.0					
Length Wtd. (ft)	1008.00	Wetted Per. (ft)	352.81	39.93	
4207.35					
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.13	0.81	
0.39					
Alpha	1.50	Stream Power (lb/ft s)	5478.15	0.00	
0.00					
Frctn Loss (ft)	2.26	Cum Volume (acre-ft)	34233.34	13653.66	
48339.79					
C & E Loss (ft)	0.03	Cum SA (acres)	3623.27	710.52	
4810.00					

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196568.8

INPUT

Description: Additional Cross Section 115.5

Station Elevation Data	num=	61							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	142	207	132	228	124	337	122	338	122
346	117.08	366	115.84	386	116.96	394	121.98	418	122.08
561	122.27	692	121.86	847	122.31	1035	121.75	1174	122
1344	121.73	1552	122	1667	122.39	1819	122.59	1973	122.35
2084	122	2139	122	2150	120	2155	119.21	2161	120
2168	122	2258	122.25	2331	121.7	2333	120.83	2337	120.87
2341	122.18	2413	122.64	2485	122.76	2605	122.52	2846	122.76
2870	122.19	2884	122.67	2903	122.25	2915	119.6	2925	119.82

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2936	121.57	3084	122.8	3272	123.06	3393	122.44	3462	122.2
3532	121.8	3550	121.7	3600	117.15	3622	117.15	3624	120
3645	127.7	3660	127.8	3857	127.3	3978	126	4028	114
4123	114	4153	124	4200	124	4296	124	4383	126
4607	130								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	338	.035	394	.08	3550	.035	3660	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

338	394	208	212	210	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2780	4607	128	F

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.52	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	123.63	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	123.63	Flow Area (sq ft)	74.03	354.00
3495.66				
E.G. Slope (ft/ft)	0.004380	Area (sq ft)	74.03	354.00
6044.23				
Q Total (cfs)	8893.00	Flow (cfs)	63.98	3287.64
5541.38				
Top Width (ft)	3549.75	Top Width (ft)	89.83	56.00
3403.92				
Vel Total (ft/s)	2.27	Avg. Vel. (ft/s)	0.86	9.29
1.59				
Max Chl Dpth (ft)	9.63	Hydr. Depth (ft)	0.82	6.32
1.47				
Conv. Total (cfs)	134375.3	Conv. (cfs)	966.8	49677.1
83731.5				
Length Wtd. (ft)		Wetted Per. (ft)	89.85	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.23	1.64
0.40				
Alpha	6.51	Stream Power (lb/ft s)	4607.00	0.00
0.00				
Frctn Loss (ft)		Cum Volume (acre-ft)	9965.23	7784.26
15569.35				
C & E Loss (ft)		Cum SA (acres)	2361.39	697.82

3348.82

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.  
 Warning: Divided flow computed for this cross-section.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	124.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.46	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	124.12	Flow Area (sq ft)	161.98	400.53
5478.19				
E.G. Slope (ft/ft)	0.003959	Area (sq ft)	161.98	400.53
8946.18				
Q Total (cfs)	15174.00	Flow (cfs)	194.46	3840.07
11139.47				
Top Width (ft)	3741.01	Top Width (ft)	111.21	56.00
3573.80				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.20	9.59
2.03				
Max Chl Dpth (ft)	10.46	Hydr. Depth (ft)	1.46	7.15
2.30				
Conv. Total (cfs)	241159.7	Conv. (cfs)	3090.6	61030.0
177039.1				
Length Wtd. (ft)	210.53	Wetted Per. (ft)	111.31	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.36	1.68
0.57				
Alpha	4.17	Stream Power (lb/ft s)	4607.00	0.00
0.00				
Frctn Loss (ft)	0.83	Cum Volume (acre-ft)	18022.52	10301.94
26153.90				
C & E Loss (ft)	0.00	Cum SA (acres)	2896.55	707.75
3830.47				

Warning: Divided flow computed for this cross-section.

PatuxentRiver.rep

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	126.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.75	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	124.75	Flow Area (sq ft)	307.68	472.80
8557.34				
E.G. Slope (ft/ft)	0.003261	Area (sq ft)	307.68	472.80
13600.14				
Q Total (cfs)	26361.00	Flow (cfs)	503.37	4595.34
21262.29				
Top Width (ft)	3809.43	Top Width (ft)	114.60	56.00
3638.84				
Vel Total (ft/s)	2.82	Avg. Vel. (ft/s)	1.64	9.72
2.48				
Max Chl Dpth (ft)	11.75	Hydr. Depth (ft)	2.68	8.44
3.59				
Conv. Total (cfs)	461589.8	Conv. (cfs)	8814.1	80465.9
372309.8				
Length Wtd. (ft)	210.39	Wetted Per. (ft)	114.94	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.55	1.63
0.73				
Alpha	2.70	Stream Power (lb/ft s)	4607.00	0.00
0.00				
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)	23433.18	11480.52
33579.19				
C & E Loss (ft)	0.02	Cum SA (acres)	3216.85	707.56
4133.26				

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	127.14	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep				
Vel Head (ft) 0.080	0.43	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 210.00	126.70	Reach Len. (ft)	208.00	212.00
Crit W.S. (ft) 10828.25	125.41	Flow Area (sq ft)	417.94	526.10
E.G. Slope (ft/ft) 17111.36	0.003974	Area (sq ft)	417.94	526.10
Q Total (cfs) 34744.38	41717.00	Flow (cfs)	911.65	6060.98
Top Width (ft) 3758.10	3931.20	Top Width (ft)	117.10	56.00
Vel Total (ft/s) 3.21	3.54	Avg. Vel. (ft/s)	2.18	11.52
Max Chl Dpth (ft) 4.54	12.70	Hydr. Depth (ft)	3.57	9.39
Conv. Total (cfs) 551151.3	661758.2	Conv. (cfs)	14461.5	96145.5
Length Wtd. (ft) 2386.97	210.27	Wetted Per. (ft)	117.61	58.91
Min Ch El (ft) 1.13	115.84	Shear (lb/sq ft)	0.88	2.22
Alpha 0.00	2.23	Stream Power (lb/ft s)	4607.00	0.00
Frctn Loss (ft) 47811.92	0.74	Cum Volume (acre-ft)	34222.74	13643.19
C & E Loss (ft) 4718.12	0.03	Cum SA (acres)	3617.88	709.42

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196356.8

#### INPUT

Description: CG - old section 115 (Laurel study)

Station Elevation Data num= 135

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	162.4	29.52	160.86	54.12	160.51	98.41	158.32	113.17	156.97
123.01	156.92	201.73	153.7	226.33	152.47	246.01	152.38	270.61	150.96
305.06	147.46	324.93	143.28	344.81	136.17	379.6	127.21	404.44	122.5

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419.35	120.57	434.26	122.26	449.17	122.91	473	123.5	479	116.34
510	115.42	539	116.55	542	123.32	608.47	123.35	623.44	122.54
638.41	123.27	653.39	122.07	678.34	122.13	738.23	121.74	753.21	121.96
853.03	121.87	887.97	122.32	912.92	121.75	947.86	121.74	982.8	120.86
1012.74	120.61	1122.55	120.59	1207.4	121.33	1237.34	120.32	1267.29	120.63
1297.24	120.36	1307.22	120.74	1367.11	120.32	1412.03	120.34	1436.99	120.93
1481.91	120.69	1501.87	120.08	1546.79	121.4	1571.75	120.27	1636.63	120.22
1686.54	120.59	1766.4	120.84	1776.38	120.47	1801.34	121.27	1821.3	120.89
1841.27	121.15	1871.21	120.85	1901.16	121.44	2005.97	121.75	2020.94	121
2040.91	121.08	2055.88	121.94	2085.83	121.58	2110.79	122.36	2140.73	121.88
2175.67	122.53	2195.64	121.18	2205.62	122.63	2215.6	122.79	2240.56	121.59
2250.54	120.38	2270.5	122.19	2290.47	122.3	2310.43	118.35	2330.4	122.99
2340.38	122.65	2365.34	123.36	2385.3	121.66	2410.26	124.13	2430.22	122.66
2440.21	123.12	2460.17	122.58	2480.14	122.79	2510.08	122.28	2545.02	122.14
2614.9	120.96	2649.84	121.21	2684.77	122	2734.69	120.83	2779.61	120.37
2804.56	120.78	2839.5	120.7	2859.47	121.24	2919.43	121.43	2959.42	120.95
3014.42	120.84	3054.42	121.1	3074.41	120.55	3094.41	121.05	3114.41	120.4
3139.41	121.08	3174.4	119.31	3189.4	119.39	3209.4	120.54	3239.4	121.07
3319.39	121.08	3329.39	120.92	3354.39	119	3369.38	120.02	3389.38	120.57
3419.38	119.33	3444.38	121.09	3479.37	122.88	3509.37	123.16	3580	122
3618	117.09	3668	117.09	3681	126	3702	127.25	3707	127.25
3711	126	3717	124	3723	122	3802	120	4003	118
4390	118	4420	116	4436	116	4539	118	4610	120
4633	122	4663	124	4692	126	4959	128	5128	130

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	473	.035	542	.08	3580	.035	3723	.055

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
473	542	758.14	773.69	678.9		.1	.3
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
2950	5128	124.6	T				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	123.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.42	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	122.84	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	122.63	Flow Area (sq ft)	44.89	441.05
3548.39				
E.G. Slope (ft/ft)	0.003419	Area (sq ft)	44.89	441.05
9158.30				

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Q Total (cfs) 5299.72	8893.00	Flow (cfs)	38.82	3554.46
Top Width (ft) 3842.88	3956.05	Top Width (ft)	44.93	68.23
Vel Total (ft/s) 1.49	2.20	Avg. Vel. (ft/s)	0.86	8.06
Max Chl Dpth (ft) 1.58	7.42	Hydr. Depth (ft)	1.00	6.46
Conv. Total (cfs) 90640.5	152095.8	Conv. (cfs)	664.0	60791.4
Length Wtd. (ft) 2243.28	705.54	Wetted Per. (ft)	45.19	75.40
Min Ch El (ft) 0.34	115.42	Shear (lb/sq ft)	0.21	1.25
Alpha 0.00	5.62	Stream Power (lb/ft s)	5128.00	0.00
Frctn Loss (ft) 15532.70	2.68	Cum Volume (acre-ft)	9964.94	7782.33
C & E Loss (ft) 3331.35	0.07	Cum SA (acres)	2361.07	697.51

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	124.04	Element	Left OB	Channel
Vel Head (ft) 0.080	0.43	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	123.61	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 5327.37		Flow Area (sq ft)	91.53	493.62
E.G. Slope (ft/ft) 12198.29	0.003912	Area (sq ft)	91.53	493.62
Q Total (cfs) 10544.95	15174.00	Flow (cfs)	97.37	4531.69
Top Width (ft) 4061.99	4205.38	Top Width (ft)	74.39	69.00
Vel Total (ft/s) 1.98	2.57	Avg. Vel. (ft/s)	1.06	9.18
Max Chl Dpth (ft)	8.19	Hydr. Depth (ft)	1.23	7.15



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2.22				
Conv. Total (cfs)	242615.3	Conv. (cfs)	1556.8	72456.6
168601.9				
Length Wtd. (ft)	698.81	Wetted Per. (ft)	74.74	76.78
2397.44				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.30	1.57
0.54				
Alpha	4.24	Stream Power (lb/ft s)	5128.00	0.00
0.00				
Frctn Loss (ft)	2.45	Cum Volume (acre-ft)	18021.92	10299.76
26102.94				
C & E Loss (ft)	0.08	Cum SA (acres)	2896.11	707.45
3812.07				

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	125.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.64	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)		Flow Area (sq ft)	171.58	565.24
7896.55				
E.G. Slope (ft/ft)	0.005085	Area (sq ft)	171.58	565.24
16434.21				
Q Total (cfs)	26361.00	Flow (cfs)	301.59	6475.76
19583.65				
Top Width (ft)	4243.15	Top Width (ft)	79.86	69.00
4094.28				
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)	1.76	11.46
2.48				
Max Chl Dpth (ft)	9.22	Hydr. Depth (ft)	2.15	8.19
1.93				
Conv. Total (cfs)	369665.4	Conv. (cfs)	4229.2	90810.8
274625.3				
Length Wtd. (ft)	696.38	Wetted Per. (ft)	80.31	76.78
4099.97				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.68	2.34
0.61				

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Alpha 0.00	3.95	Stream Power (lb/ft s)	5128.00	0.00
Frctn Loss (ft) 33506.79	2.07	Cum Volume (acre-ft)	23432.03	11477.99
C & E Loss (ft) 4114.62	0.14	Cum SA (acres)	3216.39	707.25

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	126.37	Element	Left OB	Channel
Vel Head (ft) 0.078	0.33	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	126.04	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 13613.05		Flow Area (sq ft)	288.02	661.41
E.G. Slope (ft/ft) 22159.37	0.003135	Area (sq ft)	288.02	661.41
Q Total (cfs) 34581.57	41717.00	Flow (cfs)	529.04	6606.39
Top Width (ft) 4125.74	4281.95	Top Width (ft)	87.22	69.00
Vel Total (ft/s) 2.54	2.86	Avg. Vel. (ft/s)	1.84	9.99
Max Chl Dpth (ft) 3.30	10.62	Hydr. Depth (ft)	3.30	9.59
Conv. Total (cfs) 617663.2	745109.4	Conv. (cfs)	9449.3	117997.0
Length Wtd. (ft) 4132.12	691.74	Wetted Per. (ft)	87.79	76.78
Min Ch El (ft) 0.64	115.42	Shear (lb/sq ft)	0.64	1.69
Alpha 0.00	2.58	Stream Power (lb/ft s)	5128.00	0.00
Frctn Loss (ft) 47717.26	0.75	Cum Volume (acre-ft)	34221.06	13640.30

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C & E Loss (ft)                      0.08      Cum SA (acres)                      3617.40                      709.12  
 4699.12

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1                                      RS: 195583.1

INPUT

Description: old section 114 (Laurel study)

Station Elevation Data		num= 202							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	160.17	49.25	160.38	64.03	159.25	88.65	156.33	123.13	158.3
132.98	155.19	157.6	139.37	177.49	129.91	187.46	127.21	207.41	124.79
232.34	123.25	252.29	121.43	282.21	121.34	297.16	120.78	431.8	120.78
456.73	121.07	481.66	120.78	621.28	120.91	681.12	121.76	701.07	121.78
716.03	120.83	760.9	120.82	780.85	121.75	790.82	120.81	820.74	122.18
855.65	120.78	890.55	121.16	905.51	122.09	945.4	121.51	975	122.56
986	114.29	990	113.45	1011	116.56	1021	117.15	1025	122.19
1050.03	122.88	1069.98	122.61	1089.93	121.57	1099.9	121.92	1144.78	121.36
1159.74	120.47	1189.67	120.41	1249.51	119.49	1329.3	119.31	1359.22	118.64
1374.18	119.43	1399.12	119.09	1473.92	118.84	1498.86	119.48	1533.76	118.82
1563.69	119.42	1588.62	118.53	1708.31	118.56	1763.16	119.09	1778.12	119.9
1793.09	119.1	1808.05	119.92	1872.88	119.34	1907.78	120.12	1947.68	119.54
1997.55	120.61	2042.43	120.2	2082.33	121.24	2122.22	120.6	2137.18	121.48
2157.16	120.13	2172.16	120.76	2187.15	120.04	2222.14	121.48	2242.13	120.13
2267.13	121.3	2292.12	120.26	2312.11	120.01	2322.11	120.78	2357.09	118.1
2372.09	119.08	2387.08	116.83	2402.08	120.07	2412.08	120.91	2432.07	120.32
2442.07	121.1	2467.06	121.04	2472.06	122.15	2497.05	120.54	2507.04	121.34
2537.03	120.57	2552.03	117.27	2572.02	119.23	2587.02	119.51	2607.01	120.91
2627	120.86	2656.99	119.77	2666.99	120.06	2686.98	118.84	2696.98	119.33
2721.97	118.7	2736.97	119.5	2766.95	119.1	2796.94	119.52	2811.94	118.65
2871.92	119.06	2891.91	118.66	2951.89	118.55	3001.87	119.49	3036.86	118.42
3066.85	119.72	3091.84	118.88	3101.84	119.78	3146.82	117.77	3156.82	116.39
3176.81	118.14	3191.81	115.36	3211.8	116.71	3241.79	124.24	3261.79	126.66
3276.78	127.4	3296.77	127.38	3306.77	128.21	3331.76	126.48	3346.76	123.55
3361.75	122.74	3376.75	120.33	3401.74	119.59	3416.73	118.48	3486.71	118.52
3501.7	119.17	3541.69	119.58	3576.68	119.42	3671.65	117.37	3751.62	117.67
3816.6	117.58	3836.59	116.98	3911.56	116.86	3951.55	117.37	3981.54	116.74
4041.52	116.46	4056.51	116.07	4096.5	116.14	4111.49	116.8	4171.47	117.02

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4201.46	117.64	4231.45	116.91	4251.44	117.81	4306.42	115.08	4366.39	115.21
4391.38	119.03	4401.38	119.83	4431.37	119.09	4451.36	116.54	4496.34	116.36
4516.34	117.87	4566.32	119.79	4576.31	119.62	4596.3	117.52	4626.29	117.43
4651.28	118.88	4726.25	118.91	4746.25	116.76	4756.24	116.5	4771.24	118.09
4811.22	119.08	4846.21	119.06	4866.2	117.49	4881.19	117.94	4896.19	115.7
5171.08	115.71	5211.06	118.19	5231.06	118.13	5261.04	122.11	5271.04	121
5291.03	121.02	5316.02	115.75	5331.02	115.72	5351.01	117.34	5371	119.9
5381	120.44	5400.99	119.71	5415.98	120.22	5445.97	119.89	5465.96	119.06
5500.95	119.65	5520.94	117.73	5545.93	118.95	5570.92	121.87	5595.91	123.3
5630.9	122.18	5650.89	123.25	5660.89	122.02	5675.88	122.21	5685.88	123.62
5700.87	123.58	5720.87	125.34	5765.85	125.44	5835.82	125.1	5875.8	125.44
5905.79	128.97	5930.78	128.51	5950.78	129.12	5990.76	131.55	6010.75	133.37
6020.75	133.54	6050.74	136.2						

Manning's n	Values	num=	5						
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	975	.035	1025	.08	3146.82	.035	3416.73	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	975	1025		614.52	765.33	638.85	.1	.3

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
3920	6050	121.8	T
3305	3920	116	T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	120.53	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.		0.035
0.059				
W.S. Elev (ft)	120.33	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)		Flow Area (sq ft)		200.67
3157.22				
E.G. Slope (ft/ft)	0.004246	Area (sq ft)		200.67
7843.59				
Q Total (cfs)	8893.00	Flow (cfs)		1412.42
7480.58				
Top Width (ft)	3760.16	Top Width (ft)		45.56
3714.60				
Vel Total (ft/s)	2.65	Avg. Vel. (ft/s)		7.04
2.37				
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)		4.40
1.48				
Conv. Total (cfs)	136482.1	Conv. (cfs)		21676.7
114805.4				

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Length Wtd. (ft) 2131.23	651.88	Wetted Per. (ft)		49.44
Min Ch El (ft) 0.39	113.45	Shear (lb/sq ft)		1.08
Alpha 0.00	1.80	Stream Power (lb/ft s)	6050.74	0.00
Frctn Loss (ft) 15400.21	0.56	Cum Volume (acre-ft)	9964.55	7776.63
C & E Loss (ft) 3272.46	0.05	Cum SA (acres)	2360.68	696.50

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	121.50	Element	Left OB	Channel
Vel Head (ft) 0.062	0.16	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 638.85	121.35	Reach Len. (ft)	614.52	765.33
Crit W.S. (ft) 5602.82		Flow Area (sq ft)	228.96	248.11
E.G. Slope (ft/ft) 11925.02	0.003154	Area (sq ft)	228.96	248.11
Q Total (cfs) 13392.98	15174.00	Flow (cfs)	113.63	1667.39
Top Width (ft) 4243.11	4796.62	Top Width (ft)	505.78	47.72
Vel Total (ft/s) 2.39	2.50	Avg. Vel. (ft/s)	0.50	6.72
Max Chl Dpth (ft) 2.15	7.90	Hydr. Depth (ft)	0.45	5.20
Conv. Total (cfs) 238461.4	270172.3	Conv. (cfs)	2023.2	29687.7
Length Wtd. (ft) 2612.61	648.23	Wetted Per. (ft)	505.89	52.43
Min Ch El (ft) 0.42	113.45	Shear (lb/sq ft)	0.09	0.93
Alpha 0.00	1.61	Stream Power (lb/ft s)	6050.74	0.00
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	18019.13	10293.18

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25914.95  
 C & E Loss (ft) 0.04 Cum SA (acres) 2891.06 706.41  
 3747.35

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	123.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.035
0.065				
W.S. Elev (ft)	122.91	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)		Flow Area (sq ft)	1288.37	324.77
11669.55				
E.G. Slope (ft/ft)	0.001945	Area (sq ft)	1288.37	324.77
18740.38				
Q Total (cfs)	26361.00	Flow (cfs)	1222.95	1974.13
23163.92				
Top Width (ft)	5293.99	Top Width (ft)	738.88	50.00
4505.11				
Vel Total (ft/s)	1.98	Avg. Vel. (ft/s)	0.95	6.08
1.98				
Max Chl Dpth (ft)	9.46	Hydr. Depth (ft)	1.74	6.50
2.59				
Conv. Total (cfs)	597652.9	Conv. (cfs)	27726.6	44757.2
525169.1				
Length Wtd. (ft)	645.20	Wetted Per. (ft)	739.18	55.53
4511.92				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.21	0.71
0.31				
Alpha	1.59	Stream Power (lb/ft s)	6050.74	0.00
0.00				
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	23419.33	11470.09
33232.68				
C & E Loss (ft)	0.02	Cum SA (acres)	3209.26	706.20
4047.61				

Warning: Divided flow computed for this cross-section.

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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.035
0.065				
W.S. Elev (ft)	125.49	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)		Flow Area (sq ft)	3245.92	454.00
23524.20				
E.G. Slope (ft/ft)	0.000540	Area (sq ft)	3245.92	454.00
30595.04				
Q Total (cfs)	41717.00	Flow (cfs)	2914.43	1817.21
36985.37				
Top Width (ft)	5589.87	Top Width (ft)	773.36	50.00
4766.51				
Vel Total (ft/s)	1.53	Avg. Vel. (ft/s)	0.90	4.00
1.57				
Max Chl Dpth (ft)	12.04	Hydr. Depth (ft)	4.20	9.08
4.94				
Conv. Total (cfs)	1795751.0	Conv. (cfs)	125454.5	78223.5
1592073.0				
Length Wtd. (ft)	642.23	Wetted Per. (ft)	773.76	55.53
4773.96				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.14	0.28
0.17				
Alpha	1.25	Stream Power (lb/ft s)	6050.74	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	34190.30	13630.40
47306.16				
C & E Loss (ft)	0.00	Cum SA (acres)	3609.91	708.06
4629.82				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

PatuxentRiver.rep

RIVER: Patuxent River

REACH: 1

RS: 194817.8

INPUT

Description: old section 113.1 (Laurel study)

Station Elevation Data

num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	158.5	127	156	166	154	172	152	178	150
192	148	208	146	234	144	256	142	306	140
337	138	361	136	377	134	388	132	421	122
422.97	121.58	437.9	121.01	462.78	122.09	487.66	120.76	502.59	120.86
512.54	121.77	532.45	120.88	557.33	121.29	572.26	120.72	587.18	121.09
612.07	120.97	626.99	120.29	641.92	120.64	666.8	120.26	761.35	120.3
781.25	120.96	786.23	120.43	801.16	121.03	811.11	120.13	835.99	120.66
850	121.5	880	122.06	891	113.79	895	112.95	916	116.06
926	116.65	930	121.69	959	121.22	1030.32	120.44	1040.29	119.67
1060.23	120.22	1070.2	119.63	1100.11	119.4	1110.08	119.75	1135	119.4
1164.91	119.82	1189.84	119.35	1209.78	119.53	1229.72	118.62	1249.66	119.09
1299.51	119	1309.47	117.93	1334.4	118.04	1349.35	118.77	1384.25	117.48
1409.17	117.78	1444.07	117.38	1468.99	117.4	1493.91	117.92	1518.84	117.39
1543.76	117.39	1578.66	118.24	1613.55	117.98	1628.51	118.63	1663.41	119.08
1683.4	118.87	1703.39	119.27	1738.37	118.93	1768.36	118.27	1803.34	119
1838.32	118.41	1853.32	119.13	1883.3	119.16	1898.29	118.75	1923.28	117.23
1953.26	117.21	1988.25	117.67	2008.24	117.33	2023.23	118.67	2038.22	118.25
2063.21	119.52	2088.19	118.91	2098.19	119.57	2128.17	118.54	2158.16	116.38
2173.15	117.72	2198.13	115.33	2218.12	119.64	2233.12	123.9	2243.11	125.84
2258.1	125.15	2273.09	122.76	2288.09	118.99	2308.08	119.82	2333.06	118.92
2343.06	119.51	2358.05	118.42	2368.04	118.59	2378.04	117.5	2403.02	116.42
2413.02	113.77	2572.93	115.87	2577.93	116.52	2587.93	115.44	2602.92	117.4
2637.9	117.74	2652.89	117.16	2692.87	117.22	2702.86	116.72	2742.84	115.92
2752.84	113.77	2797.81	114.35	2807.81	117.19	2822.8	117.65	2847.79	116.41
2862.78	117.18	2877.77	116.99	2907.75	117.98	2932.74	118.01	2952.73	117.18
3022.69	116.46	3037.68	115.58	3042.68	116.2	3082.66	115.96	3112.64	119.95
3152.62	118.65	3182.61	117.15	3207.59	117.91	3242.57	115.94	3287.55	115.94
3307.54	116.28	3332.53	116.04	3377.5	116.06	3442.47	115.85	3607.38	115.9
3622.37	116.75	3632.36	116.57	3662.35	117.32	3682.34	117.05	3722.32	115.33
3742.3	113.55	3812.27	113.73	3817.26	115.05	3832.26	115.37	3862.24	115.05
3952.19	115.45	3962.19	115.01	4022.15	114.8	4102.11	114.82	4132.1	115.37
4207.06	115.05	4222.05	114.78	4247.04	115.15	4287.02	114.78	4376.98	114.79
4401.97	114.98	4446.94	114.89	4461.94	115.18	4501.92	117.84	4521.91	118.37
4541.9	117.79	4561.89	116.37	4586.88	115.7	4756.79	115.71	4766.79	116.11
4821.76	116.02	4866.74	116.61	4891.73	116.03	4921.71	116.1	4941.7	116.61
4961.69	116.04	5001.67	116.88	5051.65	116.96	5061.56	117.82	5081.4	122.54
5111.14	122.22	5135.93	123.38	5155.77	123.52	5185.51	124.56	5205.35	123.48
5235.09	125.62	5259.88	126.36	5314.42	126.83	5334.25	126.66	5349.13	127.73
5359.04	130.14	5378.88	136.27	5388.79	138.37	5408.62	141.4	5438.37	143.99
5458.2	146.12	5497.87	149.27	5522.66	148.34	5542.49	148.98	5577.2	153.93
5597.03	156.24								



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Manning's n Values num= 5  
 Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val  
 0 .1 880 .035 930 .08 2173.15 .035 2413.02 .055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 880 930 862.16 963.36 666.85 .1 .3

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 2275 4250 116 T  
 4250 5100 121.2 T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	119.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.		0.035
0.056				
W.S. Elev (ft)	119.89	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)		Flow Area (sq ft)		203.35
8190.01				
E.G. Slope (ft/ft)	0.000362	Area (sq ft)		203.35
12368.46				
Q Total (cfs)	8893.00	Flow (cfs)		420.38
8472.62				
Top Width (ft)	3992.95	Top Width (ft)		45.68
3947.27				
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)		2.07
1.03				
Max Chl Dpth (ft)	6.94	Hydr. Depth (ft)		4.45
2.62				
Conv. Total (cfs)	467710.1	Conv. (cfs)		22109.3
445600.8				
Length Wtd. (ft)	686.15	Wetted Per. (ft)		49.62
3130.65				
Min Ch El (ft)	112.95	Shear (lb/sq ft)		0.09
0.06				
Alpha	1.09	Stream Power (lb/ft s)	5597.03	0.00
0.00				
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	9964.55	7773.08
15252.00				
C & E Loss (ft)	0.00	Cum SA (acres)	2360.68	695.70
3216.28				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.057				
W.S. Elev (ft)	120.85	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)		Flow Area (sq ft)	96.95	248.38
11237.89				
E.G. Slope (ft/ft)	0.000419	Area (sq ft)	96.95	248.38
16209.27				
Q Total (cfs)	15174.00	Flow (cfs)	17.30	608.51
14548.20				
Top Width (ft)	4309.43	Top Width (ft)	238.29	47.73
4023.42				
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	0.18	2.45
1.29				
Max Chl Dpth (ft)	7.90	Hydr. Depth (ft)	0.41	5.20
3.51				
Conv. Total (cfs)	741532.3	Conv. (cfs)	845.3	29736.9
710950.1				
Length Wtd. (ft)	684.91	Wetted Per. (ft)	238.40	52.45
3203.04				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.01	0.12
0.09				
Alpha	1.08	Stream Power (lb/ft s)	5597.03	0.00
0.00				
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	18016.83	10288.82
25708.64				
C & E Loss (ft)	0.00	Cum SA (acres)	2885.81	705.57
3686.73				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	122.44	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.035
0.058				
W.S. Elev (ft)	122.40	Reach Len. (ft)	862.16	963.36

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666.85				
Crit W.S. (ft)		Flow Area (sq ft)	709.14	324.72
17283.36				
E.G. Slope (ft/ft)	0.000468	Area (sq ft)	709.14	324.72
22541.41				
Q Total (cfs)	26361.00	Flow (cfs)	303.88	967.97
25089.15				
Top Width (ft)	4635.55	Top Width (ft)	460.33	50.00
4125.22				
Vel Total (ft/s)	1.44	Avg. Vel. (ft/s)	0.43	2.98
1.45				
Max Chl Dpth (ft)	9.45	Hydr. Depth (ft)	1.54	6.49
4.19				
Conv. Total (cfs)	1218553.0	Conv. (cfs)	14046.8	44745.2
1159761.0				
Length Wtd. (ft)	686.83	Wetted Per. (ft)	460.74	55.53
4130.36				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.04	0.17
0.12				
Alpha	1.13	Stream Power (lb/ft s)	5597.03	0.00
0.00				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	23405.24	11464.38
32929.96				
C & E Loss (ft)	0.00	Cum SA (acres)	3200.80	705.32
3984.32				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.33	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.058				
W.S. Elev (ft)	125.30	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)		Flow Area (sq ft)	2054.24	469.32
29463.74				
E.G. Slope (ft/ft)	0.000211	Area (sq ft)	2054.24	469.32
34721.80				
Q Total (cfs)	41717.00	Flow (cfs)	1184.56	1201.34
39331.10				
Top Width (ft)	4805.85	Top Width (ft)	469.88	50.00
4285.97				
Vel Total (ft/s)	1.30	Avg. Vel. (ft/s)	0.58	2.56

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1.33				
Max Chl Dpth (ft)	12.35	Hydr. Depth (ft)	4.37	9.39
6.87				
Conv. Total (cfs)	2870777.0	Conv. (cfs)	81516.1	82670.7
2706590.0				
Length Wtd. (ft)	688.14	Wetted Per. (ft)	470.71	55.53
4291.84				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.06	0.11
0.09				
Alpha	1.10	Stream Power (lb/ft s)	5597.03	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	34152.92	13622.28
46827.20				
C & E Loss (ft)	0.00	Cum SA (acres)	3601.14	707.18
4563.44				

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193854.4

INPUT

Description: old section 113 (Laurel study)

Station Elevation Data		num= 182							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138	92	136	181	134	271	132	337	130
466	128	603	126	697	124	699.36	123.38	709.36	123.8
739.33	122.42	754.32	120.36	764.31	120.19	809.27	120.22	849.23	120.73
864.22	120.29	899.18	120.26	914.17	120.95	934.15	120.21	974.12	120.23
984.11	119.72	1009.08	120.09	1044.05	119.61	1079.02	119.99	1094.01	119.7
1108.99	118.59	1118.99	119.29	1138.97	119.68	1163.94	119.5	1188.92	118.52
1218.89	118.54	1228.89	119.34	1253.86	118.71	1273.85	118.69	1283.84	119.39
1298.82	119	1308.81	119.37	1328.8	119.18	1338.79	118.7	1383.75	118.57
1393.74	119.23	1403.73	118.55	1433.7	118.29	1453.68	118.49	1463.67	118.21
1488.65	118.45	1503.64	118.03	1523.62	118.46	1538.61	118.11	1598.55	117.93
1648.51	117.93	1688.47	118.8	1708.45	118.15	1733.43	118.89	1757	118.94
1762	114.31	1769	112.35	1781	112.3	1802	114.36	1807	118.94
1823.35	119.89	1838.33	123.63	1858.31	127.16	1878.29	128.41	1883.28	128.17
1918.23	123.82	1948.19	117.03	1953.19	117.63	1973.16	117.14	1978.15	117.69
1998.13	118.23	2028.09	118.44	2063.04	118.1	2078.02	117.08	2098	117.99
2112.98	117.16	2127.96	117.7	2147.93	117.02	2187.88	116.89	2212.84	117.05
2227.82	117.53	2262.78	117.08	2272.77	117.19	2312.71	116.42	2337.68	116.4
2352.66	116.73	2397.6	116.54	2407.59	117.08	2422.57	116.17	2472.5	116

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2482.49	113.84	2487.48	113.77	2572.37	114.39	2577.36	115.52	2597.34	115.49
2612.32	118.5	2632.29	117.68	2642.28	118.47	2652.26	118.18	2662.25	118.95
2672.24	118.85	2692.21	115.91	2712.19	115.94	2727.17	117.34	2752.13	117.95
2762.12	117.53	2802.07	117.59	2817.05	116.94	2876.97	115.98	2926.9	116.15
2936.89	115.87	2956.86	116.54	2986.82	115.77	3016.78	115.98	3041.75	115.81
3051.74	116.26	3081.7	116.12	3091.68	115.55	3101.67	115.75	3196.55	114.87
3256.47	114.95	3271.45	115.4	3316.39	115.27	3346.35	114.88	3356.33	115.25
3381.3	114.97	3461.2	114.87	3620.99	114.97	3665.93	114.8	3685.9	114.02
3730.84	115.49	3745.82	113.55	3795.75	114.05	3815.73	116.16	3825.72	115.95
3845.69	114.41	3905.61	114.51	3920.59	114.71	3985.5	114.84	4000.48	115.26
4025.45	114.87	4060.41	114.78	4195.22	114.79	4235.17	115.54	4270.12	115.58
4330.04	116.64	4350.01	117.22	4364.99	116.87	4409.93	118.2	4469.85	118.29
4534.76	118.13	4574.7	117.38	4614.65	116.95	4679.56	116.67	4744.47	117.09
4789.41	117.07	4809.38	117.27	4839.34	117.05	4864.31	117.94	4884.28	119.44
4909.25	118.17	4939.2	118.91	4979.15	120.94	5009.11	121.35	5029.08	119.71
5049.05	118.82	5059.04	119.5	5103.98	119.36	5138.93	121.41	5163.9	122.09
5198.85	121.83	5248.78	122.81	5298.71	121.99	5318.68	124.68	5328.67	125.38
5363.62	127.02	5378.6	128.38	5408.56	130.26	5428.53	132.41	5448.51	133.61
5468.48	135.2	5493.45	138.66						

Manning's n Values	num=	4
Sta n Val	Sta n Val	Sta n Val
0 .1	1757 .035	1807 .08
	2187.88	.055

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1757	1807	512.6	496.5	483.9		.1	.3

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
4850	5200	120.94	T
1900	4300	116	T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	119.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.056				
W.S. Elev (ft)	119.68	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)		Flow Area (sq ft)	708.71	296.72
8984.09				
E.G. Slope (ft/ft)	0.000252	Area (sq ft)	708.71	296.72
10632.63				
Q Total (cfs)	8893.00	Flow (cfs)	174.50	622.66
8095.84				
Top Width (ft)	3835.75	Top Width (ft)	675.10	50.00
3110.65				

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Vel Total (ft/s) 0.90	0.89	Avg. Vel. (ft/s)	0.25	2.10
Max Chl Dpth (ft) 3.07	7.38	Hydr. Depth (ft)	1.05	5.93
Conv. Total (cfs) 510239.3	560480.0	Conv. (cfs)	10997.8	39243.0
Length Wtd. (ft) 2928.46	485.73	Wetted Per. (ft)	675.38	53.97
Min Ch El (ft) 0.05	112.30	Shear (lb/sq ft)	0.02	0.09
Alpha 0.00	1.32	Stream Power (lb/ft s)	5493.45	0.00
Frctn Loss (ft) 15075.94	0.12	Cum Volume (acre-ft)	9957.54	7767.55
C & E Loss (ft) 3162.25	0.00	Cum SA (acres)	2354.00	694.64

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	120.64	Element	Left OB	Channel
Vel Head (ft) 0.056	0.03	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	120.61	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 11700.87		Flow Area (sq ft)	1473.37	343.04
E.G. Slope (ft/ft) 13541.38	0.000306	Area (sq ft)	1473.37	343.04
Q Total (cfs) 13761.29	15174.00	Flow (cfs)	538.14	874.56
Top Width (ft) 3166.73	4191.35	Top Width (ft)	974.62	50.00
Vel Total (ft/s) 1.18	1.12	Avg. Vel. (ft/s)	0.37	2.55
Max Chl Dpth (ft) 3.98	8.31	Hydr. Depth (ft)	1.51	6.86
Conv. Total (cfs) 786369.9	867097.0	Conv. (cfs)	30751.5	49975.6
Length Wtd. (ft) 2939.17	485.88	Wetted Per. (ft)	974.97	53.97
Min Ch El (ft) 0.08	112.30	Shear (lb/sq ft)	0.03	0.12

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Alpha 0.00	1.30	Stream Power (lb/ft s)	5493.45	0.00
Frctn Loss (ft) 25480.92	0.15	Cum Volume (acre-ft)	18001.29	10282.28
C & E Loss (ft) 3631.70	0.00	Cum SA (acres)	2873.81	704.49

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	122.17	Element	Left OB	Channel
Vel Head (ft) 0.056	0.03	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	122.14	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 16539.86		Flow Area (sq ft)	3009.54	419.26
E.G. Slope (ft/ft) 18461.69	0.000334	Area (sq ft)	3009.54	419.26
Q Total (cfs) 23401.18	26361.00	Flow (cfs)	1684.57	1275.26
Top Width (ft) 3324.04	4389.64	Top Width (ft)	1015.60	50.00
Vel Total (ft/s) 1.41	1.32	Avg. Vel. (ft/s)	0.56	3.04
Max Chl Dpth (ft) 4.98	9.84	Hydr. Depth (ft)	2.96	8.39
Conv. Total (cfs) 1281244.0	1443298.0	Conv. (cfs)	92232.1	69822.0
Length Wtd. (ft) 3327.08	486.42	Wetted Per. (ft)	1016.06	53.97
Min Ch El (ft) 0.10	112.30	Shear (lb/sq ft)	0.06	0.16
Alpha 0.00	1.29	Stream Power (lb/ft s)	5493.45	0.00
Frctn Loss (ft) 32616.11	0.16	Cum Volume (acre-ft)	23368.44	11456.16
C & E Loss (ft) 3927.30	0.00	Cum SA (acres)	3186.20	704.21

Warning: Divided flow computed for this cross-section.

PatuxentRiver.rep

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.20	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.056				
W.S. Elev (ft)	125.17	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)		Flow Area (sq ft)	6205.99	570.78
26894.95				
E.G. Slope (ft/ft)	0.000170	Area (sq ft)	6205.99	570.78
28816.77				
Q Total (cfs)	41717.00	Flow (cfs)	3773.92	1521.84
36421.24				
Top Width (ft)	4623.02	Top Width (ft)	1114.80	50.00
3458.22				
Vel Total (ft/s)	1.24	Avg. Vel. (ft/s)	0.61	2.67
1.35				
Max Chl Dpth (ft)	12.87	Hydr. Depth (ft)	5.57	11.42
7.78				
Conv. Total (cfs)	3200691.0	Conv. (cfs)	289549.9	116761.7
2794379.0				
Length Wtd. (ft)	486.84	Wetted Per. (ft)	1115.41	53.97
3462.05				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.06	0.11
0.08				
Alpha	1.23	Stream Power (lb/ft s)	5493.45	0.00
0.00				
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	34071.17	13610.78
46340.85				
C & E Loss (ft)	0.00	Cum SA (acres)	3585.45	706.08
4504.16				

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193357.9

INPUT

Description:

Station Elevation Data

num= 49



PatuxentRiver.rep

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148	32	138	47	136	97	134	180	132
277	130	374	128	517	126	643	124	745	124.56
839	124	940	124.37	1047	124	1067	120	1105	119.71
1199	120	1288	120	1361	118.9	1424	118	1551	117.85
1663	118	1735	117.7	1840	118	1850	112.6	1900	112.6
1905	118	1920	124	1940	124	1955	122	1992	120
2041	118	2083	116	2100	114	2343	114	2357	116
3090	116	3581	114	3671	114	4170	116	4254	118
4471	118	4818	118	4862	120	4968	122	5101	122
5132	124	5228	124	5247	126	5267	128		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1840	.03	1905	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1840	1905		178.5	181.3		.1	.3
Ineffective Flow			num=	2				
Sta L	Sta R	Elev	Permanent					
4825	5267	124	T					
1940	4254	116	T					

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	119.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	119.56	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)		Flow Area (sq ft)	778.06	411.93
8676.09				
E.G. Slope (ft/ft)	0.000237	Area (sq ft)	778.06	411.93
10380.06				
Q Total (cfs)	8893.00	Flow (cfs)	231.98	1036.38
7624.65				
Top Width (ft)	3441.29	Top Width (ft)	522.83	65.00
2853.46				
Vel Total (ft/s)	0.90	Avg. Vel. (ft/s)	0.30	2.52
0.88				
Max Chl Dpth (ft)	6.96	Hydr. Depth (ft)	1.49	6.34
3.07				
Conv. Total (cfs)	577703.0	Conv. (cfs)	15069.7	67324.5
495308.8				
Length Wtd. (ft)	183.19	Wetted Per. (ft)	522.84	68.72
2826.81				

PatuxentRiver.rep				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.02	0.09
0.05				
Alpha	1.73	Stream Power (lb/ft s)	5267.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	9948.79	7763.51
14959.22				
C & E Loss (ft)	0.00	Cum SA (acres)	2346.95	693.99
3129.13				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	120.45	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)		Flow Area (sq ft)	1384.95	470.02
11211.77				
E.G. Slope (ft/ft)	0.000304	Area (sq ft)	1384.95	470.02
12952.15				
Q Total (cfs)	15174.00	Flow (cfs)	528.50	1463.22
13182.28				
Top Width (ft)	3748.87	Top Width (ft)	775.27	65.00
2908.60				
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)	0.38	3.11
1.18				
Max Chl Dpth (ft)	7.85	Hydr. Depth (ft)	1.79	7.23
3.94				
Conv. Total (cfs)	869850.8	Conv. (cfs)	30296.4	83879.4
755675.0				
Length Wtd. (ft)	183.17	Wetted Per. (ft)	775.33	68.72
2848.41				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.03	0.13
0.07				
Alpha	1.59	Stream Power (lb/ft s)	5267.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	17984.47	10277.64
25333.76				
C & E Loss (ft)	0.00	Cum SA (acres)	2863.51	703.83
3597.95				

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	122.01	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	121.97	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)		Flow Area (sq ft)	2564.26	568.41
15546.37				
E.G. Slope (ft/ft)	0.000312	Area (sq ft)	2564.26	568.41
17439.92				
Q Total (cfs)	26361.00	Flow (cfs)	1483.82	2033.36
22843.82				
Top Width (ft)	3868.46	Top Width (ft)	782.84	65.00
3020.62				
Vel Total (ft/s)	1.41	Avg. Vel. (ft/s)	0.58	3.58
1.47				
Max Chl Dpth (ft)	9.37	Hydr. Depth (ft)	3.28	8.74
5.40				
Conv. Total (cfs)	1492748.0	Conv. (cfs)	84024.4	115143.4
1293580.0				
Length Wtd. (ft)	183.09	Wetted Per. (ft)	783.05	68.72
2880.53				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.06	0.16
0.11				
Alpha	1.44	Stream Power (lb/ft s)	5267.00	0.00
0.00				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	23335.64	11450.53
32416.70				
C & E Loss (ft)	0.00	Cum SA (acres)	3175.61	703.56
3892.06				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.030
0.055				

PatuxentRiver.rep

W.S. Elev (ft) 183.70	125.07	Reach Len. (ft)	178.50	181.30
Crit W.S. (ft) 24963.99		Flow Area (sq ft)	5382.86	769.74
E.G. Slope (ft/ft) 27445.10	0.000196	Area (sq ft)	5382.86	769.74
Q Total (cfs) 36107.51	41717.00	Flow (cfs)	2939.26	2670.23
Top Width (ft) 3333.12	4662.23	Top Width (ft)	1264.11	65.00
Vel Total (ft/s) 1.45	1.34	Avg. Vel. (ft/s)	0.55	3.47
Max Chl Dpth (ft) 7.49	12.47	Hydr. Depth (ft)	4.26	11.84
Conv. Total (cfs) 2580811.0	2981754.0	Conv. (cfs)	210085.7	190856.4
Length Wtd. (ft) 3335.03	183.00	Wetted Per. (ft)	1264.54	68.72
Min Ch El (ft) 0.09	112.60	Shear (lb/sq ft)	0.05	0.14
Alpha 0.00	1.45	Stream Power (lb/ft s)	5267.00	0.00
Frctn Loss (ft) 46028.35	0.04	Cum Volume (acre-ft)	34002.98	13603.14
C & E Loss (ft) 4466.44	0.00	Cum SA (acres)	3571.46	705.42

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193176.6

INPUT

Description: old section 112.5 (Laurel study)

Station Elevation Data

num= 195

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	146.75	112	146	235	144	264	142	279	140
290	138	300	136	309	134	315	132	322	130
334	128	337.57	127.93	367.35	126.31	387.21	126.98	441.82	125.28
461.77	124.23	501.72	124.18	561.65	123.02	571.63	122.47	601.6	122.56
661.53	121.87	676.51	122.15	696.49	121.88	726.45	122.76	746.43	122.24
761.41	122.69	781.39	120.89	791.37	122.25	816.34	121.36	851.3	122.07
866.29	121.75	911.23	118.89	936.2	118.92	956.18	118.41	1031.09	118.42
1041.08	118.84	1071.04	118.7	1081.03	119.27	1110.99	118.78	1145.95	118.88
1175.92	119.72	1215.87	120.16	1235.84	119.28	1260.81	119.56	1290.78	118.95

PatuxentRiver.rep

1315.75	119.76	1335.72	118.88	1345.71	119.27	1385.67	118.35	1395.65	118.62
1430.61	118.25	1460.58	118.59	1480.55	118.06	1505.52	118.1	1520.5	117.66
1570.44	117.22	1595.41	117.78	1610.4	117.02	1635.37	117.3	1645.35	116.69
1675.32	117.59	1690.3	116.82	1710.28	116.77	1725.26	117.56	1760.22	116.41
1770.2	116.4	1790.18	117.47	1820	117.2	1824	112.5	1850	112.3
1876	112.5	1880	117.2	1895.06	121.89	1905.04	122.59	1920.03	121.13
1935.01	121.16	1949.99	122.01	1989.94	122.09	2009.92	120.5	2024.9	118.03
2034.88	117.16	2059.85	116.95	2069.83	117.37	2094.8	119.56	2104.78	119.96
2129.75	119.3	2144.72	119.42	2164.69	118.33	2174.68	118.43	2209.63	116.85
2234.59	116.14	2249.57	116.56	2264.55	115.94	2289.51	115.64	2304.49	116.02
2319.47	115.06	2339.44	114.72	2354.42	112.77	2364.4	113.95	2384.37	114.04
2404.34	115.83	2449.28	115.95	2464.25	114.94	2489.22	116.46	2504.2	116.77
2524.17	115.72	2539.14	113.94	2574.09	112.49	2584.08	114.35	2614.03	114.58
2624.02	114.99	2668.95	115.22	2703.9	115.66	2733.86	114.78	2748.84	115.5
2788.78	114.49	2808.75	115.13	2833.71	114.9	2883.64	115.17	2913.6	114.73
2918.59	115.12	2948.54	114.21	2968.51	114.54	2983.49	112.71	2988.49	113.47
3023.43	114.11	3038.41	113.55	3223.14	113.92	3243.11	113.8	3253.1	115.26
3273.07	115.2	3283.05	114.36	3313.01	114.14	3357.94	115.47	3382.91	115.54
3407.87	113.55	3557.65	113.86	3577.62	114.9	3607.58	115.65	3637.53	115.67
3662.5	116.3	3707.43	116.75	3732.39	116.12	3757.36	116.26	3787.31	117.51
3802.29	117.49	3837.24	116.06	3862.2	116.99	3887.17	116.7	3927.11	119.46
3952.07	120.58	3982.03	121.01	3992.01	120.66	4002	118.94	4016.98	120.45
4061.91	119.32	4146.79	120.49	4166.76	120.33	4186.73	121.14	4231.66	121.14
4251.63	120.83	4306.55	121.06	4341.5	120.85	4366.46	120.05	4421.38	119.82
4446.35	121.46	4506.26	122.52	4571.16	120.64	4596.13	122.86	4616.1	123.87
4656.04	124.39	4666.02	124.21	4690.97	122.17	4700.91	122.22	4715.83	123.72
4750.65	124.86	4765.57	124.29	4780.48	122.94	4800.38	123.75	4835.19	124.2
4855.08	126.17	4870	125.12	4879.95	125.85	4899.84	125.73	4934.65	126.69
4949.57	125.9	4964.49	126.01	4989.36	128.45	5024.17	130.54	5058.98	131.03
5118.66	135.64	5168.39	140.34	5193.26	141.03	5252.93	145.46	5282.77	146.72

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1820 .035 1880 .055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1820 1880 299.2 309.6 325.3 .1 .3

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 1920 3700 116 T  
 3935 5200 140 T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft) 119.52 Element Left OB Channel  
 Right OB  
 Vel Head (ft) 0.04 Wt. n-Val. 0.100 0.035

PatuxentRiver.rep

0.055				
W.S. Elev (ft)	119.48	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)		Flow Area (sq ft)	1093.83	405.50
5939.95				
E.G. Slope (ft/ft)	0.000434	Area (sq ft)	1093.83	405.50
7900.62				
Q Total (cfs)	8893.00	Flow (cfs)	453.81	1224.11
7215.08				
Top Width (ft)	2806.58	Top Width (ft)	829.36	60.00
1917.22				
Vel Total (ft/s)	1.20	Avg. Vel. (ft/s)	0.41	3.02
1.21				
Max Chl Dpth (ft)	7.18	Hydr. Depth (ft)	1.32	6.76
3.14				
Conv. Total (cfs)	426702.2	Conv. (cfs)	21774.8	58734.9
346192.5				
Length Wtd. (ft)	319.71	Wetted Per. (ft)	829.65	64.34
1892.31				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.04	0.17
0.09				
Alpha	1.72	Stream Power (lb/ft s)	5282.77	0.00
0.00				
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	9944.95	7761.81
14920.68				
C & E Loss (ft)	0.04	Cum SA (acres)	2344.18	693.73
3119.07				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	120.35	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)		Flow Area (sq ft)	1867.17	457.40
7601.47				
E.G. Slope (ft/ft)	0.000585	Area (sq ft)	1867.17	457.40
9663.04				

PatuxentRiver.rep

Q Total (cfs) 12371.90	15174.00	Flow (cfs)	1066.12	1735.98
Top Width (ft) 2159.42	3151.13	Top Width (ft)	931.71	60.00
Vel Total (ft/s) 1.63	1.53	Avg. Vel. (ft/s)	0.57	3.80
Max Chl Dpth (ft) 3.93	8.05	Hydr. Depth (ft)	2.00	7.62
Conv. Total (cfs) 511644.3	627526.3	Conv. (cfs)	44089.9	71792.1
Length Wtd. (ft) 1936.71	319.51	Wetted Per. (ft)	932.06	64.34
Min Ch El (ft) 0.14	112.30	Shear (lb/sq ft)	0.07	0.26
Alpha 0.00	1.64	Stream Power (lb/ft s)	5282.77	0.00
Frctn Loss (ft) 25286.08	0.38	Cum Volume (acre-ft)	17977.80	10275.71
C & E Loss (ft) 3587.26	0.02	Cum SA (acres)	2860.01	703.57

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	121.93	Element	Left OB	Channel
Vel Head (ft) 0.055	0.08	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 325.30	121.85	Reach Len. (ft)	299.20	309.60
Crit W.S. (ft) 10545.47		Flow Area (sq ft)	3304.82	547.66
E.G. Slope (ft/ft) 13270.28	0.000593	Area (sq ft)	3304.82	547.66
Q Total (cfs) 21292.74	26361.00	Flow (cfs)	2707.42	2360.85
Top Width (ft) 2580.93	3655.52	Top Width (ft)	1014.60	60.00
Vel Total (ft/s) 2.02	1.83	Avg. Vel. (ft/s)	0.82	4.31
Max Chl Dpth (ft)	9.55	Hydr. Depth (ft)	3.26	9.13

PatuxentRiver.rep

5.29				
Conv. Total (cfs)	1082270.0	Conv. (cfs)	111154.9	96926.3
874189.1				
Length Wtd. (ft)	319.44	Wetted Per. (ft)	1015.11	64.34
1994.47				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.12	0.32
0.20				
Alpha	1.50	Stream Power (lb/ft s)	5282.77	0.00
0.00				
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)	23323.62	11448.21
32351.94				
C & E Loss (ft)	0.01	Cum SA (acres)	3171.93	703.30
3880.25				

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	125.00	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)		Flow Area (sq ft)	7277.33	736.12
16985.17				
E.G. Slope (ft/ft)	0.000312	Area (sq ft)	7277.33	736.12
22060.85				
Q Total (cfs)	41717.00	Flow (cfs)	5805.89	2803.04
33108.07				
Top Width (ft)	4395.99	Top Width (ft)	1372.77	60.00
2963.22				
Vel Total (ft/s)	1.67	Avg. Vel. (ft/s)	0.80	3.81
1.95				
Max Chl Dpth (ft)	12.70	Hydr. Depth (ft)	5.30	12.27
8.27				
Conv. Total (cfs)	2361486.0	Conv. (cfs)	328655.7	158672.4
1874158.0				
Length Wtd. (ft)	319.42	Wetted Per. (ft)	1373.45	64.34
2057.85				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.10	0.22
0.16				



PatuxentRiver.rep

Alpha	1.46	Stream Power (lb/ft s)	5282.77	0.00
0.00				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	33977.05	13600.01
45923.96				
C & E Loss (ft)	0.00	Cum SA (acres)	3566.05	705.16
4453.17				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 192867

INPUT

Description:

Station Elevation Data num= 77

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	146	171	144	209	142	223	140	231	138
239	136	244	134	250	132	255	130	267	128
343	126	437	124	562	122	719	120	729	118
749	118.26	783	118	836	118	887	117.89	965	118
1138	118.26	1276	118.34	1331	118	1433	118	1510	117.64
1608	117.32	1669	116.64	1704	116	1747	118	1794	118.16
1824	117.86	1828	114.62	1857	112.3	1886	114.82	1895	120.23
1902	122.02	1916	122.61	2019	120	2068	118.75	2114	118.03
2207	117.97	2297	117.71	2380	120.05	2448	121.33	2538	120.31
2600	118.77	2660	117.5	2750	117.69	2854	118.76	2905	117.97
3009	117.08	3088	116.72	3201	117.5	3279	116.13	3416	115.57
3438	115.33	3583	116.79	3720	117.8	3787	119.58	3908	119.69
3969	119.94	3991	120	4070	122	4145	122.26	4215	122
4379	122	4573	124	4766	126	4836	128	4965	130
4986	132	5010	134	5028	136	5046	138	5056	140
5068	142	5084	143						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1824	.035	1916	.055

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1824	1916	93	92.3	92	.1	.3	

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1916	5084	116	T

CROSS SECTION OUTPUT Profile #10yr

PatuxentRiver.rep

E.G. Elev (ft) Right OB	119.16	Element	Left OB	Channel
Vel Head (ft) 0.055	0.39	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	118.76	Reach Len. (ft)	93.00	92.30
Crit W.S. (ft) 2047.47		Flow Area (sq ft)	986.58	327.57
E.G. Slope (ft/ft) 2104.48	0.005052	Area (sq ft)	986.58	327.57
Q Total (cfs) 5183.89	8893.00	Flow (cfs)	969.66	2739.45
Top Width (ft) 1422.49	2589.85	Top Width (ft)	1098.81	68.56
Vel Total (ft/s) 2.53	2.65	Avg. Vel. (ft/s)	0.98	8.36
Max Chl Dpth (ft) 1.44	6.46	Hydr. Depth (ft)	0.90	4.78
Conv. Total (cfs) 72934.5	125119.7	Conv. (cfs)	13642.6	38542.6
Length Wtd. (ft) 1422.58	92.18	Wetted Per. (ft)	1098.95	71.00
Min Ch El (ft) 0.45	112.30	Shear (lb/sq ft)	0.28	1.46
Alpha 0.00	3.63	Stream Power (lb/ft s)	5084.00	0.00
Frctn Loss (ft) 14883.32	0.24	Cum Volume (acre-ft)	9937.81	7759.20
C & E Loss (ft) 3106.60	0.08	Cum SA (acres)	2337.56	693.27

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	120.01	Element	Left OB	Channel
Vel Head (ft) 0.055	0.26	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	119.76	Reach Len. (ft)	93.00	92.30

PatuxentRiver.rep				
Crit W.S. (ft)		Flow Area (sq ft)	2083.14	396.66
3554.25				
E.G. Slope (ft/ft)	0.003456	Area (sq ft)	2083.14	396.66
3611.26				
Q Total (cfs)	15174.00	Flow (cfs)	2778.42	3061.52
9334.06				
Top Width (ft)	2879.13	Top Width (ft)	1103.79	70.21
1705.13				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.33	7.72
2.63				
Max Chl Dpth (ft)	7.46	Hydr. Depth (ft)	1.89	5.65
2.08				
Conv. Total (cfs)	258133.1	Conv. (cfs)	47265.2	52081.2
158786.7				
Length Wtd. (ft)	92.22	Wetted Per. (ft)	1104.02	72.93
1705.27				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.41	1.17
0.45				
Alpha	2.62	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	17964.24	10272.68
25236.51				
C & E Loss (ft)	0.04	Cum SA (acres)	2853.02	703.11
3572.83				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.62	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	121.47	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	4057.19	520.89
6834.90				
E.G. Slope (ft/ft)	0.001812	Area (sq ft)	4057.19	520.89
6891.90				
Q Total (cfs)	26361.00	Flow (cfs)	5716.53	3314.58
17329.89				
Top Width (ft)	3383.85	Top Width (ft)	1220.16	75.84

PatuxentRiver.rep

2087.84				
Vel Total (ft/s)	2.31	Avg. Vel. (ft/s)	1.41	6.36
2.54				
Max Chl Dpth (ft)	9.17	Hydr. Depth (ft)	3.33	6.87
3.27				
Conv. Total (cfs)	619236.9	Conv. (cfs)	134285.0	77861.6
407090.3				
Length Wtd. (ft)	92.25	Wetted Per. (ft)	1220.44	78.84
2088.06				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.38	0.75
0.37				
Alpha	1.83	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	23298.33	11444.41
32276.66				
C & E Loss (ft)	0.01	Cum SA (acres)	3164.26	702.81
3862.82				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	124.87	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	8596.70	821.79
15409.58				
E.G. Slope (ft/ft)	0.000489	Area (sq ft)	8596.70	821.79
15466.59				
Q Total (cfs)	41717.00	Flow (cfs)	9350.51	3250.50
29115.99				
Top Width (ft)	4261.31	Top Width (ft)	1428.04	92.00
2741.27				
Vel Total (ft/s)	1.68	Avg. Vel. (ft/s)	1.09	3.96
1.89				
Max Chl Dpth (ft)	12.57	Hydr. Depth (ft)	6.02	8.93
5.62				
Conv. Total (cfs)	1885696.0	Conv. (cfs)	422662.5	146929.4
1316104.0				
Length Wtd. (ft)	92.26	Wetted Per. (ft)	1428.34	95.09
2741.52				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.18	0.26

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0.17  
 Alpha 1.41 Stream Power (lb/ft s) 5084.00 0.00  
 0.00  
 Frctn Loss (ft) 0.05 Cum Volume (acre-ft) 33922.53 13594.47  
 45783.84  
 C & E Loss (ft) 0.00 Cum SA (acres) 3556.44 704.62  
 4431.87

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 192774.7

INPUT

Description:

Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	145	134	144	193	142	237	130	249	128
351	126	434	124	559	122	715	120	738	118
962	117.77	1075	118.79	1176	118.19	1386	118	1603	116
1621	116	1710	116.5	1775	117.1	1807	118	1827	118.8
1855	118	1870	112.35	1922	112.35	1924	118	2005	117
2087	117.8	2104	118	2165	117.2	2269	116.3	2446	116.8
2480	116	2554	116.4	2591	116	2656	116	2699	113.6
2712	113.6	2752	114	2755	116.9	2775	112.52	2792	111.8
2800	112.39	2816	114	2843	114.4	2860	114	2974	115.1
3113	115.2	3160	115.6	3260	116	3270	117.1	3367	117.1
3625	117.3	3692	119	3717	118	3802	118.7	3834	120
3853	120.8	4191	122	4463	124	4637	126	4984	127

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1855	.035	1924	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1855 1924 261.34 259.8 275.16 .1 .3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	118.71	Reach Len. (ft)	261.34	259.80

PatuxentRiver.rep

275.16				
Crit W.S. (ft)		Flow Area (sq ft)	1206.93	391.02
4442.56				
E.G. Slope (ft/ft)	0.001612	Area (sq ft)	1206.93	391.02
4442.56				
Q Total (cfs)	8893.00	Flow (cfs)	798.63	2021.39
6072.98				
Top Width (ft)	3027.28	Top Width (ft)	1098.46	69.00
1859.83				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	0.66	5.17
1.37				
Max Chl Dpth (ft)	6.91	Hydr. Depth (ft)	1.10	5.67
2.39				
Conv. Total (cfs)	221517.1	Conv. (cfs)	19893.2	50351.2
151272.8				
Length Wtd. (ft)	270.05	Wetted Per. (ft)	1098.54	74.02
1861.80				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.11	0.53
0.24				
Alpha	3.41	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	9935.47	7758.44
14876.40				
C & E Loss (ft)	0.01	Cum SA (acres)	2335.21	693.13
3103.13				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	119.63	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	2246.09	454.51
6178.65				
E.G. Slope (ft/ft)	0.001692	Area (sq ft)	2246.09	454.51
6178.65				
Q Total (cfs)	15174.00	Flow (cfs)	2162.63	2661.28
10350.09				
Top Width (ft)	3105.75	Top Width (ft)	1135.78	69.00
1900.97				
Vel Total (ft/s)	1.71	Avg. Vel. (ft/s)	0.96	5.86

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1.68				
Max Chl Dpth (ft)	7.83	Hydr. Depth (ft)	1.98	6.59
3.25				
Conv. Total (cfs)	368916.4	Conv. (cfs)	52578.8	64702.0
251635.5				
Length Wtd. (ft)	270.13	Wetted Per. (ft)	1135.91	74.02
1902.97				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.21	0.65
0.34				
Alpha	2.76	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	17959.62	10271.78
25226.17				
C & E Loss (ft)	0.01	Cum SA (acres)	2850.63	702.96
3569.03				

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	121.35	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	4275.20	573.06
9519.50				
E.G. Slope (ft/ft)	0.001318	Area (sq ft)	4275.20	573.06
9519.50				
Q Total (cfs)	26361.00	Flow (cfs)	5247.26	3456.21
17657.53				
Top Width (ft)	3398.65	Top Width (ft)	1245.39	69.00
2084.25				
Vel Total (ft/s)	1.83	Avg. Vel. (ft/s)	1.23	6.03
1.85				
Max Chl Dpth (ft)	9.55	Hydr. Depth (ft)	3.43	8.31
4.57				
Conv. Total (cfs)	726180.3	Conv. (cfs)	144549.0	95210.0
486421.3				
Length Wtd. (ft)	269.97	Wetted Per. (ft)	1245.55	74.02
2086.29				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.28	0.64
0.38				
Alpha	2.19	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	23289.44	11443.25

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32259.33  
 C & E Loss (ft) 0.00 Cum SA (acres) 3161.62 702.66  
 3858.41

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.82	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	9002.96	812.74
17861.13				
E.G. Slope (ft/ft)	0.000528	Area (sq ft)	9002.96	812.74
17861.13				
Q Total (cfs)	41717.00	Flow (cfs)	10354.51	3915.25
27447.23				
Top Width (ft)	4135.00	Top Width (ft)	1455.23	69.00
2610.77				
Vel Total (ft/s)	1.51	Avg. Vel. (ft/s)	1.15	4.82
1.54				
Max Chl Dpth (ft)	13.02	Hydr. Depth (ft)	6.19	11.78
6.84				
Conv. Total (cfs)	1816194.0	Conv. (cfs)	450794.6	170454.6
1194944.0				
Length Wtd. (ft)	269.92	Wetted Per. (ft)	1455.42	74.02
2612.81				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.20	0.36
0.23				
Alpha	1.79	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	33903.74	13592.74
45748.64				
C & E Loss (ft)	0.00	Cum SA (acres)	3553.36	704.45
4426.21				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1

RS: 192514.9



PatuxentRiver.rep

INPUT

Description: old section 112 (Laurel study)

Station Elevation Data		num= 190							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	139	65	138	142	136	163	134	170	132
177	130	204	128	319	126	399	124	526	122
684	120	705	118	707.59	117.54	742.56	117.03	762.54	118.1
802.51	117.21	832.49	118.36	857.47	117.42	997.35	117.29	1052.31	118.31
1147.23	117.82	1157.22	118.6	1187.19	117.69	1212.17	118.69	1222.17	117.85
1247.14	118.34	1287.11	118.23	1302.1	117.01	1327.08	117.48	1337.07	116.52
1362.05	117.51	1431.99	116.62	1461.97	116.62	1481.95	117.38	1506.93	116.21
1571.87	116.11	1591.86	115.72	1691.77	115.69	1711.76	116.49	1746.73	116.12
1776.7	117.11	1801.68	116.6	1846.65	116.61	1881.62	117.31	1901.6	118.29
1945	115.4	1949	112.7	1976	112.4	2004	112.7	2008	115.4
2041.51	118.09	2071.5	117.1	2116.49	117.82	2146.49	116.41	2211.47	116.67
2221.47	116.13	2291.46	116.27	2336.45	116.01	2361.44	116.87	2381.44	116.43
2391.44	113.98	2411.43	116.67	2436.43	116.01	2456.43	116.27	2466.42	115.19
2566.4	115.56	2611.4	115.26	2621.39	115.92	2646.39	115.09	2706.38	114.72
2726.37	115.04	2746.37	114.17	2756.37	112.1	2776.36	114.74	2791.36	115.55
2806.36	113.73	2846.35	115.38	2956.33	114.19	3021.32	114.21	3066.31	114.15
3131.29	114.62	3206.28	114.19	3271.27	114.87	3296.26	114.76	3321.26	115.87
3331.25	115.16	3406.24	117.36	3426.24	116.85	3446.23	119.97	3461.23	116.5
3471.23	115.96	3501.22	116.4	3561.21	118.51	3596.2	118.71	3676.19	118.04
3696.18	117.21	3721.18	118.76	3731.18	117.97	3761.17	119.47	3806.16	118.94
3831.16	119.56	3861.15	117.97	3881.15	118.66	3906.14	117.57	3936.14	118.4
3956.13	118.07	3966.13	119.13	3976.13	117.79	3986.13	118.5	4036.12	118.05
4051.11	119.44	4061.11	117.9	4071.11	119.08	4086.11	118.43	4096.11	119.6
4111.1	118.44	4121.1	119.37	4146.1	118.37	4176.09	118.88	4231.08	122.1
4236.08	121.85	4271.07	123.99	4291.07	120.83	4311.06	121.73	4346.06	121.3
4361.05	120.43	4426.04	120.66	4441.04	119.54	4466.03	121.43	4486.03	120.49
4506.03	122.15	4531.02	121.87	4551.02	118.67	4576.01	117.96	4596.01	119.11
4611	118.42	4631	122.24	4665.99	121.95	4690.99	122.87	4705.99	122.25
4715.98	123.69	4725.98	121.32	4765.97	121.73	4780.97	122.9	4790.97	122.16
4810.97	122.84	4885.95	122.86	4945.94	124.68	4970.93	124.31	4990.93	125.76
5000.93	124.44	5020.92	126.77	5035.92	124.7	5080.91	126.06	5090.91	127.46
5105.91	126.19	5130.9	125.78	5165.9	123.64	5195.89	124.26	5210.89	122.4
5230.88	125.89	5250.88	125.71	5260.88	124.46	5270.88	127.18	5295.87	128.91
5340.86	129.11	5350.86	130.4	5375.86	129.38	5405.85	130.62	5420.85	130.54
5495.83	132.49	5560.82	133	5590.81	131.67	5605.81	132.35	5635.8	136.11
5700.79	137.58	5745.78	136.95	5760.78	136.17	5870.76	139.47	5900.75	139.37
5925.75	140.04	5940.75	139.54	5970.74	140.29	5995.73	139.44	6015.73	140.03
6055.72	140.11	6080.72	139.06	6110.71	140.59	6150.7	139.42	6170.7	141.7

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1945	.035	2008	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

PatuxentRiver.rep

1945	2008	640.52	833.38	848.74	.1	.3
Ineffective Flow	num=	1				
Sta L	Sta R	Elev	Permanent			
4100	6170.7	130	F			

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.18	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.10	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	116.87	Flow Area (sq ft)	1199.73	337.34
3937.69				
E.G. Slope (ft/ft)	0.002582	Area (sq ft)	1199.73	337.34
3938.17				
Q Total (cfs)	8893.00	Flow (cfs)	1100.68	2189.36
5602.96				
Top Width (ft)	2757.59	Top Width (ft)	1067.50	63.00
1627.09				
Vel Total (ft/s)	1.62	Avg. Vel. (ft/s)	0.92	6.49
1.42				
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)	1.12	5.35
2.43				
Conv. Total (cfs)	175001.1	Conv. (cfs)	21659.7	43083.4
110258.0				
Length Wtd. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66
1621.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84
0.39				
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27
14849.93				
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73
3092.12				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.96	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	117.78	Flow Area (sq ft)	2253.03	392.13
5529.78				
E.G. Slope (ft/ft)	0.002836	Area (sq ft)	2253.03	392.13
5576.99				
Q Total (cfs)	15174.00	Flow (cfs)	2639.22	2948.16
9586.61				
Top Width (ft)	3399.87	Top Width (ft)	1250.13	63.00
2086.74				
Vel Total (ft/s)	1.86	Avg. Vel. (ft/s)	1.17	7.52
1.73				
Max Chl Dpth (ft)	6.86	Hydr. Depth (ft)	1.80	6.22
2.81				
Conv. Total (cfs)	284959.4	Conv. (cfs)	49563.2	55364.9
180031.4				
Length Wtd. (ft)	796.34	Wetted Per. (ft)	1250.75	64.66
1971.56				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.32	1.07
0.50				
Alpha	3.81	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	1.62	Cum Volume (acre-ft)	17946.12	10269.25
25189.04				
C & E Loss (ft)	0.05	Cum SA (acres)	2843.47	702.57
3556.43				

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.07	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep

Vel Head (ft) 0.100	0.13	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 848.74	120.93	Reach Len. (ft)	640.52	833.38
Crit W.S. (ft) 9607.51	118.59	Flow Area (sq ft)	4760.85	515.99
E.G. Slope (ft/ft) 10041.32	0.001662	Area (sq ft)	4760.85	515.99
Q Total (cfs) 16064.11	26361.00	Flow (cfs)	6730.64	3566.25
Top Width (ft) 2414.94	3812.47	Top Width (ft)	1334.53	63.00
Vel Total (ft/s) 1.67	1.77	Avg. Vel. (ft/s)	1.41	6.91
Max Chl Dpth (ft) 4.59	8.83	Hydr. Depth (ft)	3.57	8.19
Conv. Total (cfs) 394067.2	646659.3	Conv. (cfs)	165108.7	87483.4
Length Wtd. (ft) 2094.91	785.60	Wetted Per. (ft)	1335.21	64.66
Min Ch El (ft) 0.48	112.40	Shear (lb/sq ft)	0.37	0.83
Alpha 0.00	2.77	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft) 32197.55	0.78	Cum Volume (acre-ft)	23262.33	11440.00
C & E Loss (ft) 3844.20	0.03	Cum SA (acres)	3153.88	702.27

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.74	Element	Left OB	Channel
Right OB				
Vel Head (ft) 0.100	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 848.74	124.68	Reach Len. (ft)	640.52	833.38
Crit W.S. (ft)	119.34	Flow Area (sq ft)	10251.30	751.90

PatuxentRiver.rep

17441.39					
E.G. Slope (ft/ft)	0.000562	Area (sq ft)	10251.30	751.90	
20377.96					
Q Total (cfs)	41717.00	Flow (cfs)	12595.08	3884.38	
25237.54					
Top Width (ft)	4684.81	Top Width (ft)	1573.02	63.00	
3048.79					
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	1.23	5.17	
1.45					
Max Chl Dpth (ft)	12.58	Hydr. Depth (ft)	6.52	11.93	
8.34					
Conv. Total (cfs)	1759759.0	Conv. (cfs)	531301.4	163855.9	
1064602.0					
Length Wtd. (ft)	780.73	Wetted Per. (ft)	1573.73	64.66	
2094.91					
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.23	0.41	
0.29					
Alpha	1.96	Stream Power (lb/ft s)	6170.70	0.00	
0.00					
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	33845.98	13588.08	
45627.87					
C & E Loss (ft)	0.01	Cum SA (acres)	3544.27	704.06	
4408.34					

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 191681.5

INPUT

Description: CF - old section 111 (Laurel study)

Station Elevation Data num= 175

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	137	38	136	66	134	94	132	222	130
316	128	388	126	513	124	593	122	615	120
631	116	639.6	114.52	649.59	113.86	664.58	114.28	694.56	114.09
709.56	114.44	729.54	114.14	779.51	114.07	794.5	114.49	809.49	114.05
824.48	114.69	854.47	114.64	869.46	114.09	909.43	113.69	934.42	114.32
954.4	113.69	1009.37	114.18	1019.36	113.56	1044.35	114.12	1064.33	113.71
1089.32	114.32	1114.3	114.52	1139.29	113.75	1174.26	113.53	1199.25	114.37
1224.23	114.26	1239.22	113.66	1284.19	114.03	1299.18	114.88	1314.18	114.99

PatuxentRiver.rep

1339.16	114.13	1349.15	114.64	1369.14	114.48	1379.13	113.96	1429.1	113.99
1444.09	114.89	1454.09	114.24	1469.08	114.06	1489.06	114.43	1509.05	114
1544.03	114.09	1584	113.99	1603.99	114.57	1623.98	114.01	1638.97	114.78
1648.96	114.46	1673.95	114.92	1693.93	114.46	1703.93	114.57	1723.92	115.76
1753.9	114.88	1768.89	114.99	1778.88	115.65	1803.86	115.37	1843	115.91
1847	112.33	1864	112.63	1882	113.94	1884	115.95	1888.81	115.86
1903.8	116.14	1918.79	114.96	1933.78	115.22	1943.78	115.89	1968.76	115.01
1978.75	115.03	2003.73	114.32	2033.71	114.1	2053.69	115.39	2068.68	115.07
2088.66	114.08	2148.61	114.11	2168.59	114.52	2178.59	114.08	2198.57	114.24
2208.56	115.06	2228.54	114.11	2258.52	114.5	2298.49	114.41	2308.48	114.78
2338.45	114.52	2348.45	114.8	2363.43	113.93	2513.31	113.86	2533.29	114.08
2543.28	113.65	2578.25	113.7	2613.23	113.41	2623.22	113.11	2643.2	113.54
2658.19	113.07	2683.17	113.36	2693.16	113.09	2733.13	113.26	2793.08	113.1
2818.05	113.59	2833.04	113.19	2858.02	113.36	2878.01	113.89	2892.99	113.32
2932.96	113.8	2942.95	113.35	2962.93	113.3	2972.93	113.77	2987.91	113.5
3007.9	113.9	3027.88	113.27	3042.87	113.86	3052.86	113.19	3062.85	113.85
3072.84	113.5	3087.83	114.66	3107.81	112.97	3122.8	113.55	3142.79	113.42
3157.77	114.27	3172.76	112.6	3182.75	112.63	3187.75	110.55	3192.74	106.57
3197.74	111.22	3202.74	113.79	3217.72	112.89	3247.7	114.12	3267.68	112.95
3287.66	113.27	3307.65	112.78	3342.62	113.36	3352.61	112.81	3372.59	112.4
3382.59	113.04	3397.57	112.63	3402.57	111.7	3417.56	111.84	3432.54	112.89
3452.53	111.68	3462.52	112.14	3492.49	112.64	3517.47	112.33	3537.46	112.96
3567.43	112.28	3607.4	113.32	3622.39	114.16	3642.37	114.34	3657.36	115.2
3692.33	115.02	3779	116	3870	118	3921	120	3958	122
3991	124	4056	126	4089	128	4106	130	4124	132
4139	134	4154	136	4167	138	4180	140	4193	142
4207	144	4215	146	4220	148	4225	150	4243	151

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1843 .03 1884 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1843 1884 801.4 802.52 801.75 .1 .3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	116.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	116.08	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	2137.27	121.79
4395.76				
E.G. Slope (ft/ft)	0.002637	Area (sq ft)	2137.27	121.79
4395.76				

PatuxentRiver.rep				
Q Total (cfs)	8893.00	Flow (cfs)	2379.06	617.68
5896.26				
Top Width (ft)	3148.48	Top Width (ft)	1212.34	41.00
1895.14				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	1.11	5.07
1.34				
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)	1.76	2.97
2.32				
Conv. Total (cfs)	173189.3	Conv. (cfs)	46331.7	12029.2
114828.3				
Length Wtd. (ft)	801.69	Wetted Per. (ft)	1212.90	43.25
1900.50				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.29	0.46
0.38				
Alpha	1.85	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	9903.71	7751.88
14768.74				
C & E Loss (ft)	0.01	Cum SA (acres)	2311.95	691.74
3057.80				

Warning: Divided flow computed for this cross-section.  
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	117.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	117.45	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	3797.18	177.80
7032.12				
E.G. Slope (ft/ft)	0.001535	Area (sq ft)	3797.18	177.80
7032.12				
Q Total (cfs)	15174.00	Flow (cfs)	4715.78	885.34
9572.88				
Top Width (ft)	3219.79	Top Width (ft)	1217.80	41.00
1960.99				
Vel Total (ft/s)	1.38	Avg. Vel. (ft/s)	1.24	4.98
1.36				
Max Chl Dpth (ft)	10.88	Hydr. Depth (ft)	3.12	4.34

PatuxentRiver.rep

3.59				
Conv. Total (cfs)	387335.1	Conv. (cfs)	120376.1	22599.3
244359.7				
Length Wtd. (ft)	801.68	Wetted Per. (ft)	1218.53	43.25
1966.36				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.30	0.39
0.34				
Alpha	1.63	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	17901.64	10263.80
25066.21				
C & E Loss (ft)	0.01	Cum SA (acres)	2825.33	701.58
3517.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	120.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	120.22	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	7180.89	291.20
12580.66				
E.G. Slope (ft/ft)	0.000662	Area (sq ft)	7180.89	291.20
12580.66				
Q Total (cfs)	26361.00	Flow (cfs)	8895.16	1323.29
16142.55				
Top Width (ft)	3312.38	Top Width (ft)	1230.38	41.00
2041.00				
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	1.24	4.54
1.28				
Max Chl Dpth (ft)	13.65	Hydr. Depth (ft)	5.84	7.10
6.16				
Conv. Total (cfs)	1024457.0	Conv. (cfs)	345689.0	51426.4
627341.3				
Length Wtd. (ft)	801.67	Wetted Per. (ft)	1231.43	43.25
2046.42				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.24	0.28
0.25				
Alpha	1.48	Stream Power (lb/ft s)	4243.00	0.00



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0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	23174.54	11432.28
31977.16				
C & E Loss (ft)	0.01	Cum SA (acres)	3135.03	701.27
3800.79				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.42	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	124.38	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	12486.36	462.02
21240.01				
E.G. Slope (ft/ft)	0.000304	Area (sq ft)	12486.36	462.02
21240.01				
Q Total (cfs)	41717.00	Flow (cfs)	14228.39	1936.57
25552.04				
Top Width (ft)	3514.33	Top Width (ft)	1353.90	41.00
2119.43				
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	1.14	4.19
1.20				
Max Chl Dpth (ft)	17.81	Hydr. Depth (ft)	9.22	11.27
10.02				
Conv. Total (cfs)	2390961.0	Conv. (cfs)	815483.5	110992.1
1464485.0				
Length Wtd. (ft)	801.66	Wetted Per. (ft)	1355.06	43.25
2124.97				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.18	0.20
0.19				
Alpha	1.44	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	33678.81	13576.46
45222.42				
C & E Loss (ft)	0.01	Cum SA (acres)	3522.75	703.06
4357.99				

PatuxentRiver.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190879.0

INPUT

Description: old section 110.1 (Laruel study)

Station Elevation Data		num= 182							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	136	44	134	80	132	118	130	138	128
162	126	202	124	281	122	418	120	519.98	117.84
554.98	117.41	564.98	116.68	579.98	116.76	594.98	115.85	604.98	115.94
624.97	114.71	639.97	114.85	649.97	114.33	669.97	114.15	689.97	113.05
694.97	113.7	719.97	112.5	734.97	112.93	749.97	112.23	779.97	112.45
789.97	111.93	804.97	112.2	824.97	111.92	849.97	112.2	859.97	111.94
989.96	111.86	1014.96	112.55	1044.96	111.97	1064.96	112.45	1079.96	111.86
1134.95	111.88	1149.95	112.19	1169.95	113.21	1189.95	112.49	1219.95	112.97
1259.95	111.95	1279.95	112.79	1294.95	111.92	1354.94	111.94	1384.94	112.49
1399.94	111.95	1434.94	112.31	1454.94	111.97	1474.94	113.49	1494.94	112.28
1509.94	112.42	1524.94	111.99	1554.93	113.17	1589.93	112.63	1644.93	112.66
1659.93	113.1	1684.93	112.48	1769.92	113.16	1799.92	112.08	1814.92	112.44
1824.92	113.91	1834.92	114.27	1866.04	114.19	1867.4	113.64	1867.465	110.96
1872.5	108.76	1878.39	110.86	1878.675	113.83	1904.515	114.24	1914.92	112.81
1939.92	114.24	1959.91	112.66	1979.91	113.44	2004.91	112.68	2014.91	113.01
2029.91	112.64	2074.89	112.93	2089.88	112.53	2104.87	113.06	2139.84	112.63
2164.82	113.06	2239.77	112.47	2259.75	111.91	2289.73	111.93	2324.7	112.4
2339.69	113.19	2364.67	112.94	2379.66	112.26	2459.59	112.26	2479.58	112.79
2499.56	112.48	2524.54	112.72	2569.51	112.02	2599.48	112.13	2604.48	112.54
2654.44	111.84	2714.39	112.02	2754.36	111.88	2774.35	112.46	2784.34	112.04
2814.32	112.1	2839.3	112.47	2884.26	112.37	2909.24	111.67	2924.23	113.25
2944.21	111.39	2959.2	113.67	2964.2	113.7	2984.18	109.53	2999.17	111.14
3014.16	111.51	3029.15	111.2	3039.14	108.52	3044.14	105.82	3054.13	110.29
3064.12	111.42	3069.12	110.55	3084.1	112.72	3104.09	112.47	3124.07	112.76
3149.05	110.95	3169.04	111.83	3189.02	110.94	3194.02	111.59	3204.01	110.95
3214	111.77	3228.99	111.34	3243.98	112.68	3258.97	112.11	3278.95	112.29
3303.93	111.91	3313.93	112.29	3333.91	111.83	3348.9	112.16	3363.89	111.54
3378.87	112.73	3388.87	112.2	3423.84	111.85	3438.83	112.64	3458.81	111.65
3478.8	112.47	3498.78	114.12	3548.74	111.33	3558.73	111.56	3593.71	111.21
3643.67	111.33	3668.65	112.08	3683.64	110.97	3723.6	110.92	3748.59	111.21
3758.58	110.93	3788.55	111.18	3833.52	111.25	3848.51	111.72	3863.5	111.31
3898.47	111.19	3913.46	111.59	3938.44	111	3978.41	111.34	4023.37	110.96
4123.29	111	4138.28	111.3	4163.26	111.09	4203.23	111.69	4238.2	112.97
4258.19	113.37	4273.18	112.24	4298.16	111.42	4313.14	111.39	4328.13	112.17

PatuxentRiver.rep

4348.12	114.49	4378.09	116.23	4413	118.76	4432.7	120.69	4462.26	122.54
4501.68	126.11	4526.31	129.48	4570.65	132.16	4605.14	133.05	4649.48	136.44
4708.6	140.35	4723.38	140.77						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1867.4	.0319	04.515	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1867.4	1904.515		697.31	727.92		.1	.3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	115.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	115.21	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	3318.91	89.96
7874.60				
E.G. Slope (ft/ft)	0.000624	Area (sq ft)	3318.91	89.96
7874.60				
Q Total (cfs)	8893.00	Flow (cfs)	2361.45	181.41
6350.13				
Top Width (ft)	3743.54	Top Width (ft)	1250.49	37.11
2455.94				
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)	0.71	2.02
0.81				
Max Chl Dpth (ft)	9.39	Hydr. Depth (ft)	2.65	2.42
3.21				
Conv. Total (cfs)	355879.5	Conv. (cfs)	94500.5	7259.8
254119.2				
Length Wtd. (ft)	779.48	Wetted Per. (ft)	1251.21	43.26
2460.41				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.10	0.08
0.12				
Alpha	1.10	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	9853.52	7749.93
14655.82				
C & E Loss (ft)	0.00	Cum SA (acres)	2289.30	691.02
3017.76				

CROSS SECTION OUTPUT Profile #50yr

PatuxentRiver.rep

E.G. Elev (ft) Right OB	116.91	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	116.90	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 12046.76		Flow Area (sq ft)	5468.69	152.65
E.G. Slope (ft/ft) 12046.76	0.000419	Area (sq ft)	5468.69	152.65
Q Total (cfs) 10492.68	15174.00	Flow (cfs)	4322.45	358.87
Top Width (ft) 2482.75	3825.23	Top Width (ft)	1305.37	37.11
Vel Total (ft/s) 0.87	0.86	Avg. Vel. (ft/s)	0.79	2.35
Max Chl Dpth (ft) 4.85	11.08	Hydr. Depth (ft)	4.19	4.11
Conv. Total (cfs) 512423.5	741042.0	Conv. (cfs)	211092.6	17525.8
Length Wtd. (ft) 2487.28	776.38	Wetted Per. (ft)	1306.15	43.26
Min Ch El (ft) 0.13	108.76	Shear (lb/sq ft)	0.11	0.09
Alpha 0.00	1.13	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 24890.63	0.27	Cum Volume (acre-ft)	17816.40	10260.76
C & E Loss (ft) 3476.10	0.00	Cum SA (acres)	2802.12	700.86

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	119.95	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	119.93	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 19651.20		Flow Area (sq ft)	9638.57	265.42
E.G. Slope (ft/ft) 19651.20	0.000241	Area (sq ft)	9638.57	265.42

PatuxentRiver.rep				
Q Total (cfs) 17804.63	26361.00	Flow (cfs)	7872.25	684.12
Top Width (ft) 2520.46	4003.83	Top Width (ft)	1446.25	37.11
Vel Total (ft/s) 0.91	0.89	Avg. Vel. (ft/s)	0.82	2.58
Max Chl Dpth (ft) 7.80	14.11	Hydr. Depth (ft)	6.66	7.15
Conv. Total (cfs) 1146717.0	1697795.0	Conv. (cfs)	507016.9	44061.3
Length Wtd. (ft) 2525.11	773.95	Wetted Per. (ft)	1447.07	43.26
Min Ch El (ft) 0.12	108.76	Shear (lb/sq ft)	0.10	0.09
Alpha 0.00	1.16	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 31680.54	0.17	Cum Volume (acre-ft)	23019.82	11427.15
C & E Loss (ft) 3758.81	0.00	Cum SA (acres)	3110.41	700.55

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.25	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	124.24	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 30628.53		Flow Area (sq ft)	16422.08	425.24
E.G. Slope (ft/ft) 30628.53	0.000135	Area (sq ft)	16422.08	425.24
Q Total (cfs) 27559.78	41717.00	Flow (cfs)	13032.10	1125.12
Top Width (ft) 2576.51	4283.81	Top Width (ft)	1670.19	37.11
Vel Total (ft/s) 0.90	0.88	Avg. Vel. (ft/s)	0.79	2.65
Max Chl Dpth (ft) 11.89	18.42	Hydr. Depth (ft)	9.83	11.46
Conv. Total (cfs) 2367605.0	3583823.0	Conv. (cfs)	1119561.0	96657.0
Length Wtd. (ft) 2581.34	772.15	Wetted Per. (ft)	1671.06	43.26

	PatuxentRiver.rep			
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.08	0.08
0.10				
Alpha	1.19	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	33412.89	13568.29
44745.08				
C & E Loss (ft)	0.00	Cum SA (acres)	3494.94	702.34
4314.77				

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 190151.1

INPUT

Description: old section 110 (Laurel study)

Station	Elevation	Data	num=	201					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.02	10	137.21	59.99	135.81	79.99	134.8	139.99	133.2
154.99	133.33	179.98	132.05	224.98	131.03	234.98	131.87	254.98	132.03
264.98	131.07	274.98	128.58	289.97	122.91	304.97	118.05	314.97	115.58
334.97	112.42	339.97	112.01	359.97	112.24	379.97	112.06	394.96	113.42
414.96	114.11	429.96	111.95	449.96	112.24	464.96	113.17	484.96	113.51
504.95	111.85	554.95	111.87	564.95	112.36	579.95	111.85	804.93	111.86
829.93	112.22	844.93	111.89	969.91	111.88	979.91	112.19	994.91	111.88
1059.91	111.87	1079.9	112.23	1089.9	111.9	1134.9	111.93	1144.9	112.22
1159.9	111.86	1189.89	111.89	1194.89	112.37	1229.89	111.86	1244.89	112.62
1269.89	112.62	1294.88	112.99	1324.88	113.88	1341.2	113.19	1342.6	112.65
1342.7	109.96	1348	107.76	1354.2	109.86	1354.5	112.83	1381.7	113.24
1399.87	113.26	1414.87	112.14	1434.87	112.91	1464.87	112.08	1474.87	112.65
1514.86	111.51	1554.86	111.37	1594.85	111.64	1604.85	111.27	1619.85	111.94
1634.85	110.77	1649.85	110.6	1669.85	110.89	1689.84	110.46	1699.84	109.48
1719.84	109.97	1729.84	109.03	1754.84	108.45	1764.84	106.19	1769.84	109.02
1774.84	110.15	1789.84	110.22	1809.83	111.25	1834.83	111.02	1864.83	111.38
1874.83	110.97	1904.82	111.13	1919.82	111.6	1949.82	110.65	1964.82	110.93
1989.82	110.58	2004.81	110.93	2024.81	110.48	2074.79	110.21	2119.77	110.31
2154.76	111.15	2184.74	110.53	2229.73	110.57	2244.72	110.96	2259.71	110.59
2269.71	111.15	2299.7	110.22	2329.69	110.19	2344.68	110.54	2384.67	110.37
2424.65	110.7	2454.64	110.49	2459.64	110.96	2484.63	110.44	2494.62	110.89
2514.61	110.4	2524.61	110.71	2539.61	110.4	2554.6	111	2574.59	110.12
2584.59	110.57	2604.58	110.01	2679.55	109.93	2689.55	110.72	2709.54	109.9
2724.53	110.25	2749.52	109.93	2784.51	110.87	2819.5	109.8	2849.48	110.25
2869.48	110.02	2904.46	110.18	2924.45	109.97	2934.45	110.41	2969.44	109.82
2989.43	110.56	3009.42	110.07	3059.4	110.15	3089.39	110.41	3104.38	110.04
3144.37	110.14	3199.35	110.08	3209.34	111.07	3224.34	110.48	3249.33	110.32

## **Hec-Ras Input and Output Data Files**

**(Existing with Berm)**

# EXISTING WITH BERM INPUT & OUTPUT DATA

PatuxentRiver.rep

HEC-RAS Version 4.1.0 Jan 2010  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```
X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X       X  X      X  X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X       X  X      X  X              X
X      X  X       X   X      X  X      X  X              X
X      X  XXXXXX   XXXX     X  X      X  X      XXXXX
```

## PROJECT DATA

Project Title: Patuxent River  
Project File : PatuxentRiver.prj  
Run Date and Time: 6/6/2019 7:56:47 AM

Project in English units

## Project Description:

Patuxent River - Anne Arundel County (Including the Laurel model) - Detailed Method

Vertical Datum: North American Vertical Datum 88 (NAVD88)

Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet

Geographic Coordinate System: North American 1983 Datum: North American 1983

Created by: Prince Georges County, MD in cooperation with USACE - Buffalo District as part of FEMA Map Modernization study for Anne Arundel County

GeoRAS Version: 4.2.92

ArcGIS Version: 9.2

## Reach Boundary

Conditions: Known WS Elevations from the 1985 FIS Report for Anne Arundel County.



PatuxentRiver.rep

\*\*\* This tributary was formerly known as Little Patuxent River Trib 2. The channel has been relocated to Dorsey Run. New ground data was provided for this model in CAD format. \*\*\*

PLAN DATA

Plan Title: Patuxent River - Multiple Run  
Plan File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model with Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.p06

Geometry Title: Patuxent River  
Geometry File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model with Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.g01

Flow Title : 1985 FIS Flows  
Flow File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model with Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.f01

Plan Summary Information:

Number of:	Cross Sections = 226	Multiple Openings = 1
	Culverts = 0	Inline Structures = 0
	Bridges = 15	Lateral Structures = 0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 40
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

PatuxentRiver.rep

Flow Title: 1985 FIS Flows

Flow File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06  
 Resubmission to MDE\Hec-Ras\Existing Hec-Ras Model with  
 Berm\HEC\_RAS\_MODEL\_1521666726504\PatuxentRiver.f01

Flow Data (cfs)

River	Reach	RS	10yr	50yr
100yr	500yr			
Patuxent River	1	216363.5	8277	15174
26258	41717			
Patuxent River	1	209431.5	8324	15174
26267	41717			
Patuxent River	1	200115.4	8893	15174
26361	41717			
Patuxent River	1	177708.1	8893	17000
26361	45000			
Patuxent River	1	127390.9	19000	35000
45000	70000			
Patuxent River	1	66861.67	24500	43000
52500	77000			

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Patuxent River	1	10yr	
Normal S = 0.0014			
Patuxent River	1	50yr	
Normal S = 0.0014			
Patuxent River	1	100yr	
Normal S = 0.0014			
Patuxent River	1	500yr	
Normal S = 0.0014			

GEOMETRY DATA

Geometry Title: Patuxent River

PatuxentRiver.rep

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =  
 Submerged Inlet + Outlet Cd = .8  
 Max Low Cord = 140.7

Additional Bridge Parameters

Add Friction component to Momentum  
 Do not add Weight component to Momentum  
 Class B flow critical depth computations use critical depth  
 inside the bridge at the upstream end  
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 201119

INPUT

Description: CH - D/S Bridge #14 - old section 119.2 (Laurel study)

Station Elevation Data		num=		163					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	156.23	24.93	157.24	59.82	156.77	144.57	156.95	174.48	155.91
229.32	155.56	259.23	148.84	284.16	145.36	309.08	145.6	343.98	144.01
418.76	143.38	433.72	141.72	453.66	143.79	498.52	143.39	543.39	140.37
563.33	140.14	588.26	141.46	608.2	140.11	628.14	142.01	643.09	145.48
653.07	146.23	668.02	142.62	682.98	145.58	692.95	146.42	702.92	144.84
712.89	146.04	722.86	143.35	732.83	142.98	752.77	139.09	767.77	145.39
832.76	145.07	882.76	143.37	902.76	143.41	962.75	141.75	977.75	142.34
1047.75	141.76	1082.75	140.7	1122.74	140.55	1152.74	139.23	1177.74	138.72
1237.73	139.34	1272.73	138.32	1312.73	138.41	1332.73	137.4	1347.73	138.4
1367.72	138.27	1382.72	136.93	1397.72	137.45	1432.72	135.8	1452.72	136.91
1492.72	133.44	1512.71	135.31	1527.71	135.06	1542.71	132.62	1587.71	129.61
1607.71	127.86	1702.7	127.91	1717.7	130.49	1732.7	130.14	1752.7	130.85
1772.7	130.19	1822.69	129.91	1852.69	129.01	1882.69	129.11	1927.68	128.56
1942.68	129.03	1977.68	128.62	1987.68	129.51	1997.68	128.24	2037.68	128.09
2062.67	128.68	2077.67	128.38	3067.62	130.11	3105	130.1	3203	129.8
3205	129.8	3323	129.6	3325	129.6	3341	129.03	3354	123.76
3371	121.95	3391	124.21	3392	127.3	3462	129.58	3465	129.21
3582	129.61	3584	129.64	3702	129.64	3704	129.42	3802	129.75

PatuxentRiver.rep

3802.59	130.61	3842.59	131.04	3857.59	132.53	3882.59	140.16	3892.58	141.71
3922.58	141.77	3932.58	139.66	3952.58	131.89	3962.58	130.58	3997.58	128.99
4042.58	129.76	4057.58	131.17	4077.58	135.76	4092.57	136.73	4107.57	136.07
4147.57	137.73	4202.56	136.72	4212.56	137.39	4237.54	137.17	4267.42	135.98
4282.36	136.64	4302.28	136.18	4352.08	137.27	4367.02	136.9	4416.82	139.3
4441.72	139.19	4456.66	139.8	4501.48	138.97	4541.32	140.12	4581.16	139.35
4601.08	136.43	4611.04	137.04	4625.98	139.98	4650.88	140.99	4660.84	140.2
4670.8	137.76	4680.76	139.46	4690.72	138.58	4705.66	140.89	4720.6	139.43
4745.5	138.94	4770.4	141.08	4795.3	138.08	4805.26	140.48	4815.22	140.77
4825.18	139.13	4840.12	141.98	4865.02	142.4	4879.96	140.97	4894.9	137.13
4904.86	136.17	4929.76	139.09	4939.72	139.23	4964.62	136.82	4984.54	141.6
5004.46	140.74	5009.44	139.67	5024.38	141.71	5044.3	142.56	5123.98	143.1
5183.74	141.02	5203.66	141.11	5218.6	140.26	5243.5	140.09	5268.4	141.17
5343.1	141.48	5363.02	142.09	5387.92	141.68	5407.84	142.98	5427.76	142.39
5467.6	145.2	5496.25	145.22	5543.6	144.26				

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 3325 .03 3462 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 3325 3462 55.2 60.26 138.48 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 3055 134.3 F  
 3565 5543.6 134.3 T

Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 3935.67 4090.2 136.51

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	133.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.53	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	131.64	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	131.64	Flow Area (sq ft)	478.21	655.35
232.29				
E.G. Slope (ft/ft)	0.006059	Area (sq ft)	4182.05	655.35
747.25				
Q Total (cfs)	8324.00	Flow (cfs)	809.71	7052.29
462.00				
Top Width (ft)	2291.19	Top Width (ft)	1767.59	137.00
386.60				
Vel Total (ft/s)	6.09	Avg. Vel. (ft/s)	1.69	10.76

PatuxentRiver.rep

1.99				
Max Chl Dpth (ft)	9.69	Hydr. Depth (ft)	1.77	4.78
2.26				
Conv. Total (cfs)	106934.9	Conv. (cfs)	10402.0	90597.8
5935.1				
Length Wtd. (ft)	61.35	Wetted Per. (ft)	270.00	140.55
103.02				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.67	1.76
0.85				
Alpha	2.65	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	10293.43	7828.18
16071.38				
C & E Loss (ft)	0.29	Cum SA (acres)	2454.33	703.35
3463.86				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	135.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	134.91	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	133.19	Flow Area (sq ft)	10040.63	1103.17
750.21				
E.G. Slope (ft/ft)	0.000469	Area (sq ft)	10040.63	1103.17
2045.57				
Q Total (cfs)	15174.00	Flow (cfs)	10137.01	4672.52
364.47				
Top Width (ft)	2369.27	Top Width (ft)	1828.90	137.00
403.37				

PatuxentRiver.rep

Vel Total (ft/s) 0.49	1.28	Avg. Vel. (ft/s)	1.01	4.24
Max Chl Dpth (ft) 1.86	12.96	Hydr. Depth (ft)	5.49	8.05
Conv. Total (cfs) 16833.4	700834.6	Conv. (cfs)	468193.4	215807.7
Length Wtd. (ft) 404.29	58.62	Wetted Per. (ft)	1829.80	140.55
Min Ch El (ft) 0.05	121.95	Shear (lb/sq ft)	0.16	0.23
Alpha 0.00	3.82	Stream Power (lb/ft s)	5543.60	0.00
Frctn Loss (ft) 27377.79	0.07	Cum Volume (acre-ft)	18492.72	10356.75
C & E Loss (ft) 3981.60	0.41	Cum SA (acres)	2977.48	713.19

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface

whose main channel velocity head was the closest to the previously computed cross section.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	134.69	Element	Left OB	Channel
Vel Head (ft) 0.100	0.39	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 138.48	134.30	Reach Len. (ft)	55.20	60.26
Crit W.S. (ft) 506.63	134.30	Flow Area (sq ft)	8938.68	1020.24
E.G. Slope (ft/ft) 1801.98	0.002014	Area (sq ft)	8938.68	1020.24
Q Total (cfs) 394.05	26267.00	Flow (cfs)	17370.37	8502.58
Top Width (ft)	2350.12	Top Width (ft)	1811.73	137.00

PatuxentRiver.rep

401.39				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.94	8.33
0.78				
Max Chl Dpth (ft)	12.35	Hydr. Depth (ft)	4.93	7.45
1.26				
Conv. Total (cfs)	585270.5	Conv. (cfs)	387039.3	189451.0
8780.1				
Length Wtd. (ft)	57.42	Wetted Per. (ft)	1812.52	140.55
402.22				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.62	0.91
0.16				
Alpha	3.97	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	24063.84	11546.98
35602.64				
C & E Loss (ft)	0.10	Cum SA (acres)	3304.88	712.88
4352.60				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	136.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	135.52	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.31	Flow Area (sq ft)	11182.25	1187.97
1000.51				
E.G. Slope (ft/ft)	0.002581	Area (sq ft)	11182.25	1187.97
2295.87				
Q Total (cfs)	41717.00	Flow (cfs)	27936.44	12403.58
1376.99				
Top Width (ft)	2398.71	Top Width (ft)	1856.31	137.00
405.40				
Vel Total (ft/s)	3.12	Avg. Vel. (ft/s)	2.50	10.44

PatuxentRiver.rep

1.38				
Max Chl Dpth (ft)	13.57	Hydr. Depth (ft)	6.02	8.67
2.47				
Conv. Total (cfs)	821176.1	Conv. (cfs)	549913.3	244157.6
27105.3				
Length Wtd. (ft)	59.01	Wetted Per. (ft)	1857.27	140.55
406.41				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.97	1.36
0.40				
Alpha	3.77	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	34769.74	13701.57
49616.18				
C & E Loss (ft)	0.15	Cum SA (acres)	3703.75	714.67
4958.74				

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 201058.7

INPUT

Description: old section 119.1 (Laurel study)

Station Elevation Data	num=	171							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	147.89	59.96	146.91	94.93	147.39	129.91	146.92	169.88	145.98
189.87	145.16	204.86	142.09	209.85	143.47	224.84	145.23	244.83	144.25
279.8	144.51	294.79	144.02	309.78	144.64	344.76	142.98	364.75	142.39
379.74	143.17	409.71	141.75	419.71	142.21	434.7	141.49	449.69	142.04
469.67	140.4	489.66	140.84	499.65	140.2	514.64	141.63	589.59	138.54
609.58	139.31	634.56	139.17	649.55	138.38	669.53	138.97	689.52	138.03
699.51	138.77	719.5	138.93	739.48	138.28	769.46	138.29	779.46	137.4
809.44	137.67	859.4	136.94	864.4	137.43	879.39	135.24	904.37	133.95
939.35	132.95	989.31	132.17	1029.28	130.45	1054.27	128.56	1069.25	130.66
1089.24	130.52	1114.22	128.35	1129.21	127.86	1164.19	127.95	1199.16	130.15
1209.16	130.2	1254.12	131.94	1274.11	131.13	1354.05	129.64	1389.03	127.22
1399.02	128.19	1424	128.6	1438.99	127.71	1453.98	127.81	1468.97	126.94
1493.95	128.53	1513.94	127.34	1523.93	127.96	1543.92	126.4	1568.9	126.19
2423.3	127.19	2433.29	127.51	2498.24	127.54	2578.19	128.6	2618.16	128.43
2648.13	128.63	2663.12	129.2	2678.11	128.65	2698.1	128.74	2708.09	129.78
2723.08	129.53	2738.07	130.28	2748.06	129.55	2763.05	130.01	2773	129.46
2780	123.53	2805	122.96	2831	123.15	2833	127.89	2850.37	131.41
2864.99	134.79	2879.87	135.8	2914.6	136.47	2924.52	137.7	2934.44	136.97
2954.29	137.98	2964.21	137.5	2979.09	135.27	3003.89	140.21	3048.54	140.74
3058.46	140.58	3088.22	141.51	3103.11	141	3127.91	141.61	3137.83	141.13



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3172.56	141.75	3192.4	141.25	3207.28	141.54	3237.04	140.41	3251.93	139.43
3271.77	139.11	3301.53	136.31	3321.38	135.3	3341.22	133.09	3366.02	131.26
3380.9	128.73	3390.83	128.18	3425.62	128.77	3445.56	127.41	3465.49	127.31
3495.4	128.43	3520.32	127.43	3535.27	128.91	3555.21	130.05	3575.15	130.45
3580	131.2	3581	149.2	3729	149.2	3730	136.2	3759.56	134.46
3774.51	135.31	3789.46	133.34	3804.42	136.42	3844.29	135.43	3864.22	135.93
3879.18	135.34	3904.1	135.36	3934	135.88	3953.94	137.31	3988.83	137.76
4013.75	134.93	4023.72	136	4038.67	134.01	4048.64	135.94	4068.57	132.04
4103.46	133.08	4143.33	131.37	4158.29	132.01	4178.22	131.52	4188.19	132.13
4233.04	131.94	4352.66	132.01	4407.48	133.85	4447.35	135.7	4467.29	134.46
4482.24	135.62	4532.08	136.12	4542.04	135.84	4561.98	137.51	4566.96	136.8
4576.93	137.91	4611.82	138.56	4626.77	139.45	4700	141.2	4701	149.2
4789	149.2	4790	141.2	4796.22	139.61	4811.17	138.48	4856.03	139.71
4889.42	140.1	4920.64	139.79	4956.02	141.14	4980.73	140.9	4990.61	139.96
5020.26	140.32								

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1	2773 .035	2833 .1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
2773	2833	508.58	943.33	306.29	.1	.3	
Ineffective Flow	num=	2					
Sta L	Sta R	Elev	Permanent				
0	2300	133.7	F				
2935	5020.26	133.7	T				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	132.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.56	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	130.88	Flow Area (sq ft)	1616.58	476.43
33.19				
E.G. Slope (ft/ft)	0.004020	Area (sq ft)	6620.18	476.43
671.30				
Q Total (cfs)	8324.00	Flow (cfs)	3454.77	4822.86
46.37				
Top Width (ft)	2057.21	Top Width (ft)	1750.19	60.00
247.02				
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.14	10.12
1.40				
Max Chl Dpth (ft)	8.60	Hydr. Depth (ft)	3.42	7.94
1.84				

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Conv. Total (cfs) 731.4	131290.5	Conv. (cfs)	54490.4	76068.7
Length Wtd. (ft) 18.38	688.29	Wetted Per. (ft)	473.16	65.33
Min Ch El (ft) 0.45	122.96	Shear (lb/sq ft)	0.86	1.83
Alpha 0.00	4.00	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 16069.13	2.12	Cum Volume (acre-ft)	10286.58	7827.40
C & E Loss (ft) 3462.86	0.22	Cum SA (acres)	2452.10	703.21

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	134.52	Element	Left OB	Channel
Vel Head (ft) 0.100	1.47	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	133.06	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 65.01	132.41	Flow Area (sq ft)	2324.88	566.28
E.G. Slope (ft/ft) 1346.84	0.005581	Area (sq ft)	9308.10	566.28
Q Total (cfs) 136.37	15174.00	Flow (cfs)	7458.82	7578.81
Top Width (ft) 581.96	2479.30	Top Width (ft)	1837.35	60.00
Vel Total (ft/s) 2.10	5.13	Avg. Vel. (ft/s)	3.21	13.38
Max Chl Dpth (ft) 2.65	10.10	Hydr. Depth (ft)	4.92	9.44
Conv. Total (cfs) 1825.5	203120.5	Conv. (cfs)	99844.4	101450.7
Length Wtd. (ft)	665.55	Wetted Per. (ft)	473.16	65.33

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25.03				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	1.71	3.02
0.90				
Alpha	3.59	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	2.77	Cum Volume (acre-ft)	18480.46	10355.60
27372.40				
C & E Loss (ft)	0.34	Cum SA (acres)	2975.16	713.05
3980.03				

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	134.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.15	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	133.70	Flow Area (sq ft)	11342.85	632.05
364.40				
E.G. Slope (ft/ft)	0.001462	Area (sq ft)	11342.85	632.05
2019.28				
Q Total (cfs)	26267.00	Flow (cfs)	21404.90	4658.18
203.92				
Top Width (ft)	2578.35	Top Width (ft)	1872.54	60.00
645.82				
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)	1.89	7.37
0.56				
Max Chl Dpth (ft)	11.19	Hydr. Depth (ft)	6.06	10.53
0.56				
Conv. Total (cfs)	687042.1	Conv. (cfs)	559868.6	121839.8
5333.7				
Length Wtd. (ft)	580.09	Wetted Per. (ft)	1873.57	65.33
650.38				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	0.55	0.88
0.05				

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Alpha 0.00	2.77	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 35596.57	1.08	Cum Volume (acre-ft)	24050.99	11545.83
C & E Loss (ft) 4350.93	0.01	Cum SA (acres)	3302.54	712.75

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	135.82	Element	Left OB	Channel
Vel Head (ft) 0.100	0.27	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 306.29	135.54	Reach Len. (ft)	508.58	943.33
Crit W.S. (ft) 1368.41	133.70	Flow Area (sq ft)	13967.83	715.58
E.G. Slope (ft/ft) 3032.09	0.001868	Area (sq ft)	13967.83	715.58
Q Total (cfs) 1290.76	41717.00	Flow (cfs)	33950.66	6475.58
Top Width (ft) 874.08	2829.77	Top Width (ft)	1895.69	60.00
Vel Total (ft/s) 0.94	2.60	Avg. Vel. (ft/s)	2.43	9.05
Max Chl Dpth (ft) 1.57	12.58	Hydr. Depth (ft)	7.37	11.93
Conv. Total (cfs) 29867.5	965307.3	Conv. (cfs)	785598.7	149841.1
Length Wtd. (ft) 880.99	558.38	Wetted Per. (ft)	1896.77	65.33
Min Ch El (ft) 0.18	122.96	Shear (lb/sq ft)	0.86	1.28
Alpha 0.00	2.60	Stream Power (lb/ft s)	5020.26	0.00
Frctn Loss (ft) 49607.71	1.27	Cum Volume (acre-ft)	34753.80	13700.25
C & E Loss (ft) 4956.70	0.01	Cum SA (acres)	3701.37	714.54

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Warning: Divided flow computed for this cross-section.  
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
REACH: 1 RS: 200115.4

INPUT

Description: old section 118 (Laurel study)

Station Elevation Data		num= 203							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148.03	24.97	148.06	39.96	147.25	89.9	147.57	139.85	146.64
169.82	146.95	194.79	148.02	239.74	146.73	274.71	145.45	304.67	144.82
339.64	145.33	349.63	144.86	359.62	143.06	374.6	143.85	399.57	144.05
444.52	142.92	484.48	143.44	534.43	143.04	549.41	142.38	589.37	142.63
624.33	142.11	639.32	142.7	669.28	142.19	709.24	139.52	754.19	137.8
769.18	136.89	809.13	132.81	864.07	129.41	894.04	129.03	914.02	128.04
929	127.91	958.97	125.98	983.94	125.62	1028.9	125.62	1053.87	129.28
1078.84	129.79	1093.83	130.75	1118.8	130.44	1128.79	130.9	1188.72	131.69
1233.68	131.03	1278.63	129.1	1323.58	128.37	1358.54	126.74	1393.5	126.87
1413.48	126.49	1438.46	125.28	1468.42	124.59	1503.39	124.88	1523.36	124.57
1558.33	125.22	1593.29	124.58	1608.27	125.18	1743.13	125.13	1788.08	125.61
1863	125.51	1887.97	126.04	1917.94	125.63	1972.88	126.12	2017.83	126.19
2062.78	126.62	2077.77	126.49	2107.74	127.04	2117.73	126.51	2132.71	127.2
2162.68	127.39	2187.65	128.21	2207.63	127.89	2237.6	128.72	2267.56	127.72
2282.55	128.56	2317.48	128.41	2327.44	128.9	2339	128.9	2344	122.06
2360	122.31	2374	122.74	2378	124.57	2389	124.85	2396	129.51
2407.17	129.18	2422.08	127.58	2451.92	128.1	2471.81	132.14	2496.67	132.6
2526.5	135.4	2541.42	137.62	2556.33	136.96	2586.17	137.57	2601.08	137.27
2630.91	138.24	2650.8	139.31	2680.64	139.59	2700.53	141.48	2710.47	141.71
2725.39	143.56	2755.22	142.03	2829.8	143.57	2864.61	143.31	2899.41	144.3
2969.02	145.01	3028.69	144.14	3043.6	144.68	3058.52	144	3098.3	143.62
3133.1	142.81	3172.94	140.39	3197.87	140.66	3207.85	140.24	3217.82	138.35
3237.77	131.58	3247.74	129.45	3267.69	127.62	3287.64	126.5	3312.57	126.52
3392.36	125.49	3407.32	125.8	3427.27	124.89	3447.21	126.37	3467.16	125.89
3497.08	125.99	3517.03	126.83	3571.89	126.39	3601.81	127.08	3616.77	126.75
3636.71	127.44	3681.59	127.33	3691.57	126.64	3711.52	127.81	3756.4	127.53
3826.21	125.95	3836.19	126.26	3871.09	125.73	3965.84	125.76	4005.74	127.25
4020.7	127.03	4045.63	129.79	4055.61	130.12	4080.54	126.23	4110.46	124.63
4175.29	124.86	4220.17	123.76	4265.05	124.01	4285	123.55	4314.92	123.47
4334.87	124.18	4349.83	125.69	4369.78	131.94	4374.76	132.82	4404.68	133.83
4424.63	133.99	4494.45	133.45	4634.08	131.65	4673.97	132.01	4748.77	131.89

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4793.65	132.89	4813.6	132.73	4828.56	133.61	4843.52	133.48	4858.48	131.93
4883.42	133.14	4913.34	132.99	4942.56	131.82	5035.47	132.79	5051.63	133.33
5075.87	133.09	5090	133.2	5091	149.2	5259	149.2	5260	133.2
5276.36	132.51	5291.3	131.9	5316.21	132.11	5326.17	132.8	5356.06	133.53
5375.99	133.35	5390.93	132.54	5420.82	132.61	5445.73	131.75	5490.56	132.02
5510.49	131.13	5525.43	131.86	5535.39	131.31	5555.32	128.79	5565.28	130.7
5575.25	130.98	5585.21	129.47	5620.08	126.39	5635.02	127.4	5649.97	125.24
5664.91	121.75	5669.89	115.42	5674.88	120.84	5699.78	127.99	5709.75	129.97
5724.69	129.91	5749.6	132.97	5759.56	132.52	5784.47	138.37	5799.39	139.66
5824.2	138.26	5844.04	137.93	5868.84	138.65				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	2339	.035	2396	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	2339	2396		1501.45	1527.39	1537.6	.1 .3
Ineffective Flow			num=	2			
Sta L	Sta R	Elev	Permanent				
0	1400	132.4	F				
2720	5868.84	132.4	T				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	130.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.22	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	129.95	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3574.28	352.67
101.46				
E.G. Slope (ft/ft)	0.002467	Area (sq ft)	4394.33	352.67
4920.18				
Q Total (cfs)	8893.00	Flow (cfs)	6430.24	2362.31
100.45				
Top Width (ft)	2692.55	Top Width (ft)	1306.08	57.00
1329.47				
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.70
0.99				
Max Chl Dpth (ft)	14.53	Hydr. Depth (ft)	3.81	6.19
1.56				
Conv. Total (cfs)	179043.9	Conv. (cfs)	129460.8	47560.6
2022.5				
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29
65.30				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.59	0.87

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0.24 Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00
0.00 Frctn Loss (ft)	2.98	Cum Volume (acre-ft)	10222.28	7818.42
16049.47 C & E Loss (ft)	0.04	Cum SA (acres)	2434.26	701.94
3457.31				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	131.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.34	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.07	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	129.18	Flow Area (sq ft)	4629.43	416.72
177.63				
E.G. Slope (ft/ft)	0.003232	Area (sq ft)	5913.01	416.72
6454.26				
Q Total (cfs)	15174.00	Flow (cfs)	11326.50	3570.83
276.68				
Top Width (ft)	2864.15	Top Width (ft)	1412.85	57.00
1394.30				
Vel Total (ft/s)	2.90	Avg. Vel. (ft/s)	2.45	8.57
1.56				
Max Chl Dpth (ft)	15.65	Hydr. Depth (ft)	4.93	7.31
2.52				
Conv. Total (cfs)	266915.0	Conv. (cfs)	199236.4	62811.8
4866.8				
Length Wtd. (ft)	1518.83	Wetted Per. (ft)	939.20	62.29
70.95				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.99	1.35
0.51				
Alpha	2.58	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	2.81	Cum Volume (acre-ft)	18391.61	10344.96
27344.98				

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C & E Loss (ft)	0.08	Cum SA (acres)	2956.18
3973.08			711.78

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	133.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	132.98	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	130.23	Flow Area (sq ft)	8785.64	525.67
1406.11				
E.G. Slope (ft/ft)	0.002456	Area (sq ft)	8785.64	525.67
9690.71				
Q Total (cfs)	26361.00	Flow (cfs)	20723.30	4584.07
1053.63				
Top Width (ft)	3733.63	Top Width (ft)	1531.57	57.00
2145.05				
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	2.36	8.72
0.75				
Max Chl Dpth (ft)	17.56	Hydr. Depth (ft)	5.74	9.22
0.66				
Conv. Total (cfs)	531954.1	Conv. (cfs)	418187.7	92504.7
21261.8				
Length Wtd. (ft)	1517.63	Wetted Per. (ft)	1532.39	62.29
2156.41				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.88	1.29
0.10				
Alpha	2.91	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.09	Cum Volume (acre-ft)	23933.48	11533.30
35555.40				
C & E Loss (ft)	0.04	Cum SA (acres)	3282.67	711.48
4341.12				



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Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	134.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.21	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	131.43	Flow Area (sq ft)	10678.64	595.85
4305.03				
E.G. Slope (ft/ft)	0.002819	Area (sq ft)	10678.64	595.85
12605.12				
Q Total (cfs)	41717.00	Flow (cfs)	30573.57	6051.75
5091.68				
Top Width (ft)	4085.40	Top Width (ft)	1543.63	57.00
2484.77				
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)	2.86	10.16
1.18				
Max Chl Dpth (ft)	18.79	Hydr. Depth (ft)	6.92	10.45
1.73				
Conv. Total (cfs)	785769.8	Conv. (cfs)	575875.1	113989.1
95905.5				
Length Wtd. (ft)	1519.35	Wetted Per. (ft)	1544.51	62.29
2498.53				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	1.22	1.68
0.30				
Alpha	2.95	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.34	Cum Volume (acre-ft)	34609.93	13686.05
49552.73				
C & E Loss (ft)	0.06	Cum SA (acres)	3681.30	713.27
4944.89				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and

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previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 198588.0

INPUT

Description: old section 117 (Laurel study)

Station Elevation Data		num= 200							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	149.39	14.97	148	64.89	145.63	99.82	142.72	134.76	140.73
149.74	139.54	209.63	136.68	234.59	134.78	249.56	134.78	279.51	133.2
334.41	131.91	349.39	131.86	399.3	130.84	429.24	129.61	464.18	129.63
514.1	128.49	569	127.87	603.94	126.44	633.88	126.25	653.85	125.34
713.74	124.75	733.71	125.18	758.66	124.74	798.59	124.71	858.49	124.12
883.45	123.45	888.44	123.87	948.33	123.7	968.3	123.25	1003.23	124.28
1033.18	123.7	1078.1	124.71	1093.08	124.26	1113.04	124.95	1147.98	125.37
1157.96	124.94	1172.94	125.76	1192.9	125.36	1227.84	125.81	1247.8	126.59
1267.46	126.18	1275	125.76	1285	120.1	1300	119.57	1313	120.29
1325	126.09	1350.14	127.02	1380.01	126.12	1389.97	126.46	1419.84	126.23
1464.65	127.02	1474.61	126.48	1499.51	126.45	1514.44	127.05	1544.32	126.96
1549.3	126.32	1564.23	127.1	1579.17	126.26	1589.13	127.38	1609.04	126.35
1633.94	126.87	1648.87	127.74	1663.81	126.71	1683.73	126.34	1693.68	127.19
1718.58	127.02	1733.51	126.39	1828.11	125.52	1867.94	124.19	1937.65	124.37
1972.5	124.83	1997.4	123.46	2017.31	125.08	2047.18	125.39	2091.99	124.82
2116.89	125.31	2156.72	125	2181.62	125.26	2251.32	125.13	2321.03	123.98
2345.92	124.5	2375.8	124.47	2400.69	123.4	2425.59	124.43	2445.5	123.86
2490.33	124.3	2520.31	124.13	2555.28	123.31	2585.25	124.92	2625.22	124.61
2640.21	124.08	2665.19	124.53	2680.17	123.93	2725.14	123.82	2750.12	123.49
2775.1	124.15	2810.07	123.69	2845.04	124.13	2860.02	125.16	2870.02	124.27
2899.99	124.69	2909.98	124.15	2929.97	124.72	2949.95	124.2	2969.93	125.05
2984.92	124.21	3004.9	121.61	3034.88	124.47	3054.86	124.44	3064.85	125.23
3079.84	123.64	3104.82	124.58	3129.8	123.7	3144.79	125.46	3154.78	125.63
3169.77	124.3	3194.75	123.68	3224.72	123.88	3279.68	123.48	3309.65	124.02
3339.63	123.04	3459.53	123.07	3504.49	123.37	3529.47	124.59	3589.42	124.34
3609.4	124.54	3619.39	123.9	3639.38	124.65	3729.3	123.7	3759.28	125.54
3799.24	124.92	3849.2	125.33	3899.16	123.92	3934.13	125.59	3954.12	122.97
3969.1	125.15	3979.1	125.78	4004.07	125.29	4029.05	122.85	4039.05	122.62
4103.99	125.79	4138.96	125.11	4163.94	124.16	4223.9	124.02	4243.88	123.24
4253.87	123.84	4273.86	123.8	4313.83	122.61	4333.81	123.27	4358.79	123.37
4418.75	122.28	4438.73	123.01	4468.71	123.15	4498.68	122.56	4523.66	122.84
4558.64	122.11	4588.61	122.75	4658.56	121.92	4683.54	122.35	4726.94	122.06
4761.66	122.24	4805.07	121.91	4822.43	121.07	4848.47	121.93	4900.56	122.17

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4930.94	121.6	4956.98	122.23	4974.34	122.1	5017.74	122.9	5043.79	122.76
5056.81	123.41	5087.77	122.18	5097.63	122.61	5107.48	121.63	5132.11	121.98
5137.03	121.07	5146.88	115.92	5151.81	118.44	5171.51	125.54	5186.29	126.76
5205.99	122.49	5215.85	121.38	5230.62	122.11	5245.4	121.89	5265.1	120.06
5284.81	125.95	5294.7	126.51	5344.18	126	5354.07	126.41	5393.66	129.67
5428.29	127.98	5438.19	128.08	5453.03	129.46	5477.77	130.22	5512.4	133.01
5542.09	134.48	5576.72	133.9	5611.36	134.33	5690.52	137.63	5710.31	138.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1275	.035	1325	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1275	1325		993.28	988.41		.1	.3
Ineffective Flow			num=	1				
Sta L	Sta R	Elev	Permanent					
3300	5710.31	129.4	T					

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	127.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	127.06	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	1537.60	288.75
4258.44				
E.G. Slope (ft/ft)	0.001594	Area (sq ft)	1537.60	288.75
11795.11				
Q Total (cfs)	8893.00	Flow (cfs)	1561.88	1518.43
5812.70				
Top Width (ft)	4720.23	Top Width (ft)	686.18	50.00
3984.05				
Vel Total (ft/s)	1.46	Avg. Vel. (ft/s)	1.02	5.26
1.36				
Max Chl Dpth (ft)	11.14	Hydr. Depth (ft)	2.24	5.77
2.22				
Conv. Total (cfs)	222719.4	Conv. (cfs)	39116.2	38028.0
145575.3				
Length Wtd. (ft)	950.09	Wetted Per. (ft)	686.38	52.85
1923.48				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.22	0.54
0.22				
Alpha	2.87	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	10120.05	7807.18

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15754.46  
 C & E Loss (ft) 0.01 Cum SA (acres) 2399.93 700.07  
 3363.53

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and  
 previous cross section. This may indicate the  
 need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	128.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	128.44	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	2519.62	357.84
6977.53				
E.G. Slope (ft/ft)	0.001198	Area (sq ft)	2519.62	357.84
17382.17				
Q Total (cfs)	15174.00	Flow (cfs)	2889.84	1882.30
10401.86				
Top Width (ft)	4883.49	Top Width (ft)	756.54	50.00
4076.95				
Vel Total (ft/s)	1.54	Avg. Vel. (ft/s)	1.15	5.26
1.49				
Max Chl Dpth (ft)	12.52	Hydr. Depth (ft)	3.33	7.16
3.53				
Conv. Total (cfs)	438334.3	Conv. (cfs)	83479.4	54374.3
300480.6				
Length Wtd. (ft)	949.13	Wetted Per. (ft)	756.76	52.85
1976.46				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.25	0.51
0.26				
Alpha	2.20	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	18246.28	10331.38
26924.28				
C & E Loss (ft)	0.00	Cum SA (acres)	2918.80	709.91
3876.52				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	130.12	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.13	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	130.00	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)		Flow Area (sq ft)	3764.88	435.62
11328.46				
E.G. Slope (ft/ft)	0.001715	Area (sq ft)	3764.88	435.62
23778.18				
Q Total (cfs)	26361.00	Flow (cfs)	6222.47	3125.54
17012.99				
Top Width (ft)	5050.65	Top Width (ft)	855.16	50.00
4145.49				
Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	1.65	7.17
1.50				
Max Chl Dpth (ft)	14.08	Hydr. Depth (ft)	4.40	8.71
2.73				
Conv. Total (cfs)	636495.9	Conv. (cfs)	150243.9	75467.2
410784.8				
Length Wtd. (ft)	949.26	Wetted Per. (ft)	855.41	52.85
4153.02				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.47	0.88
0.29				
Alpha	2.85	Stream Power (lb/ft s)	5710.31	0.00
0.00				
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	23717.19	11516.44
34964.70				
C & E Loss (ft)	0.02	Cum SA (acres)	3241.54	709.60
4230.10				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

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E.G. Elev (ft) Right OB	131.15	Element	Left OB	Channel
Vel Head (ft) 0.080	0.14	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 937.73	131.01	Reach Len. (ft)	993.28	988.41
Crit W.S. (ft) 15541.01		Flow Area (sq ft)	4644.58	486.31
E.G. Slope (ft/ft) 27990.72	0.001765	Area (sq ft)	4644.58	486.31
Q Total (cfs) 29148.13	41717.00	Flow (cfs)	8760.30	3808.58
Top Width (ft) 4162.58	5096.60	Top Width (ft)	884.02	50.00
Vel Total (ft/s) 1.88	2.02	Avg. Vel. (ft/s)	1.89	7.83
Max Chl Dpth (ft) 3.73	15.09	Hydr. Depth (ft)	5.25	9.73
Conv. Total (cfs) 693857.4	993053.5	Conv. (cfs)	208534.7	90661.5
Length Wtd. (ft) 4170.14	947.76	Wetted Per. (ft)	884.28	52.85
Min Ch El (ft) 0.41	119.57	Shear (lb/sq ft)	0.58	1.01
Alpha 0.00	2.16	Stream Power (lb/ft s)	5710.31	0.00
Frctn Loss (ft) 48836.25	1.24	Cum Volume (acre-ft)	34345.84	13667.08
C & E Loss (ft) 4827.57	0.02	Cum SA (acres)	3639.46	711.39

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 197599.6

INPUT

Description: old section 116 (Laurel study)

Station Elevation Data num= 200

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.54	9.98	138.69	29.95	137.94	64.89	135.54	74.87	135.17
99.82	135.02	119.79	135.47	159.72	133.91	169.7	132.9	189.67	132.97
219.61	131.84	244.57	131.51	314.45	129.86	369.35	129.59	384.32	129.26
414.27	129.22	434.24	128.76	444.22	129.07	469.17	128.37	524.08	128.65
578.98	127.48	608.93	128.1	643.87	128.5	693.78	130.24	713.74	130
743.69	130.86	758.66	131.69	773.64	131.54	818.56	131.77	838.52	132.09
848.51	131.75	863.48	133.73	873.46	134.14	883.44	133.24	905	126.93
945	124.89	954	121.64	963	120.9	967	119.69	980	117.91
991	118.52	1000	125.86	1028.19	124.94	1058.14	124.73	1068.12	124.28
1083.09	124.53	1103.06	123.82	1118.03	124.7	1152.97	123.36	1177.93	123.52
1202.88	123.1	1232.83	123.23	1272.76	123.04	1337.64	123.22	1417.5	122.71
1502.35	122.98	1567.24	123	1612.16	122.51	1672.06	122.97	1751.92	122.84
1771.88	122.56	1806.82	122.48	1841.76	122.02	1881.69	121.89	1926.61	122.32
1941.58	122.65	1991.49	121.85	2041.41	122.51	2086.33	122.1	2121.26	122.36
2151.21	122	2166.19	121.15	2196.13	121.68	2216.1	122.64	2246.05	123.18
2271.01	123.19	2280.99	122.87	2345.91	124.06	2390.85	123.77	2410.83	123.8
2440.79	124.24	2495.72	123.2	2545.66	123.73	2585.61	123.18	2600.59	123.28
2625.56	122.81	2660.51	123.68	2685.48	124.02	2705.45	123.97	2715.44	122.85
2730.42	123.58	2740.41	122.81	2750.4	123.42	2760.38	123.3	2775.36	123.86
2790.35	123.43	2805.33	124.57	2810.32	124.12	2830.3	120.2	2835.29	120.38
2855.26	123.56	2870.24	123.17	2885.23	124.25	2925.17	123.87	2955.14	124.73
2980.1	124.2	3025.05	122.18	3035.03	122.02	3109.94	122.07	3134.91	122.72
3154.88	122.59	3194.83	122.91	3254.76	122.65	3274.73	123.3	3299.7	123.62
3319.67	123.2	3329.66	123.6	3349.64	123.58	3399.57	122.47	3454.5	122.77
3509.43	121.92	3524.41	121.06	3544.39	121.12	3574.35	122.26	3589.33	121.31
3604.31	123.23	3614.3	123.65	3669.23	122.99	3684.21	121.73	3704.18	121.1
3784.08	121.08	3804.06	122.1	3834.02	121.54	3849	122.39	3873.97	122.13
3903.93	123.18	3948.87	122.71	3973.84	122.77	4003.8	122.36	4053.74	122.01
4072.68	122.13	4123.8	121.34	4142.39	121.5	4151.68	121.04	4179.57	121.35
4235.34	121.31	4292.66	120.32	4302.58	120.81	4322.42	121.02	4342.25	119.66
4362.09	119.14	4381.93	119.17	4391.84	120.2	4411.68	120.77	4431.52	120.78
4451.35	118.36	4456.31	115.62	4476.15	120.11	4491.02	124.76	4500.94	126.53
4505.9	127.3	4525.74	125.67	4550.53	122.94	4580.29	121.32	4605.11	120.49
4620.08	121.3	4635.04	120.27	4669.96	119.1	4689.92	117.72	4784.71	117.73
4809.65	117.72	4849.56	117.88	4869.52	118.61	4884.48	118.45	4904.44	118.8
4934.37	122.13	4969.29	123.67	5034.14	125.08	5074.05	125.14	5089.02	125.68
5113.96	125.53	5128.93	126.29	5153.88	126.73	5168.84	128.87	5178.82	129.47
5188.8	128.42	5203.76	129.61	5213.74	129.09	5223.72	130.23	5238.68	130.13
5263.63	130.48	5278.59	130.19	5308.53	131.4	5348.44	130.58	5373.38	131.33
5413.29	130.67	5428.26	131.19	5438.23	132.72	5458.19	131.48	5478.15	131.05

Manning's n	Values	num=	6	Sta	n Val	Sta	n Val	Sta	n Val
0	.04	578.98	.1	963	.035	1000	.08	4431.52	.035
5034.14	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

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963      1000                      1000.4 1030.79 1005.5                      .1                      .3

Ineffective Flow                      num=                      1

Sta L    Sta R    Elev    Permanent

3300 5478.15    127.1                      T

Right Levee                      Station= 4505.9                      Elevation=    127.3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	125.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.83	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	124.38	Flow Area (sq ft)	72.72	229.99
6380.18				
E.G. Slope (ft/ft)	0.001109	Area (sq ft)	72.72	229.99
11252.60				
Q Total (cfs)	8893.00	Flow (cfs)	56.44	1045.69
7790.87				
Top Width (ft)	3569.39	Top Width (ft)	36.40	36.96
3496.03				
Vel Total (ft/s)	1.33	Avg. Vel. (ft/s)	0.78	4.55
1.22				
Max Chl Dpth (ft)	10.21	Hydr. Depth (ft)	2.00	6.22
2.78				
Conv. Total (cfs)	267038.3	Conv. (cfs)	1694.9	31399.9
233943.4				
Length Wtd. (ft)	1007.56	Wetted Per. (ft)	37.02	39.88
2300.25				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.14	0.40
0.19				
Alpha	2.11	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	1.29	Cum Volume (acre-ft)	10101.69	7801.29
15506.38				
C & E Loss (ft)	0.01	Cum SA (acres)	2391.69	699.08
3283.02				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.



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CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	127.31	Element	Left OB	Channel
Vel Head (ft) 0.080	0.08	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 1005.50	127.23	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 9748.55	124.84	Flow Area (sq ft)	142.07	281.73
E.G. Slope (ft/ft) 16148.27	0.001367	Area (sq ft)	142.07	281.73
Q Total (cfs) 13407.98	15174.00	Flow (cfs)	139.13	1626.89
Top Width (ft) 3505.43	3601.44	Top Width (ft)	59.01	37.00
Vel Total (ft/s) 1.38	1.49	Avg. Vel. (ft/s)	0.98	5.77
Max Chl Dpth (ft) 2.78	11.61	Hydr. Depth (ft)	2.41	7.61
Conv. Total (cfs) 362607.4	410368.0	Conv. (cfs)	3762.7	43997.9
Length Wtd. (ft) 3509.47	1007.40	Wetted Per. (ft)	59.71	39.93
Min Ch El (ft) 0.24	117.91	Shear (lb/sq ft)	0.20	0.60
Alpha 4505.90	2.36	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 26563.37	1.06	Cum Volume (acre-ft)	18215.93	10324.12
C & E Loss (ft) 3794.91	0.01	Cum SA (acres)	2909.50	708.92

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	129.11	Element	Left OB	Channel
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PatuxentRiver.rep

Vel Head (ft) 0.076	0.05	Wt. n-Val.	0.087	0.035
W.S. Elev (ft) 1005.50	129.06	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 17482.71	125.41	Flow Area (sq ft)	422.91	349.70
E.G. Slope (ft/ft) 27552.18	0.000697	Area (sq ft)	422.91	349.70
Q Total (cfs) 24350.59	26361.00	Flow (cfs)	345.46	1664.96
Top Width (ft) 4186.27	4527.10	Top Width (ft)	303.83	37.00
Vel Total (ft/s) 1.39	1.44	Avg. Vel. (ft/s)	0.82	4.76
Max Chl Dpth (ft) 4.18	13.44	Hydr. Depth (ft)	1.39	9.45
Conv. Total (cfs) 922535.1	998700.7	Conv. (cfs)	13087.8	63077.7
Length Wtd. (ft) 4191.22	1006.90	Wetted Per. (ft)	304.84	39.93
Min Ch El (ft) 0.18	117.91	Shear (lb/sq ft)	0.06	0.38
Alpha 4505.90	1.55	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 34412.20	0.77	Cum Volume (acre-ft)	23669.44	11507.53
C & E Loss (ft) 4140.42	0.00	Cum SA (acres)	3228.32	708.62

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	129.89	Element	Left OB	Channel
Vel Head (ft) 0.075	0.08	Wt. n-Val.	0.077	0.035
W.S. Elev (ft) 1005.50	129.81	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 20616.97	126.00	Flow Area (sq ft)	690.61	377.26
E.G. Slope (ft/ft) 30686.44	0.001009	Area (sq ft)	690.61	377.26

PatuxentRiver.rep				
Q Total (cfs)	41717.00	Flow (cfs)	755.00	2273.16
38688.84				
Top Width (ft)	4681.35	Top Width (ft)	424.32	37.00
4220.03				
Vel Total (ft/s)	1.92	Avg. Vel. (ft/s)	1.09	6.03
1.88				
Max Chl Dpth (ft)	14.19	Hydr. Depth (ft)	1.63	10.20
4.89				
Conv. Total (cfs)	1313629.0	Conv. (cfs)	23774.3	71579.5
1218276.0				
Length Wtd. (ft)	1006.78	Wetted Per. (ft)	425.45	39.93
4225.09				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.10	0.59
0.31				
Alpha	1.42	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	1.38	Cum Volume (acre-ft)	34285.01	13657.28
48204.66				
C & E Loss (ft)	0.00	Cum SA (acres)	3624.54	710.41
4737.35				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1 RS: 196568.8

#### INPUT

Description: Additional Cross Section 115.5

Station Elevation Data		num=		26					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	142	207	132	228	124	337	122	338	122
394	121.98	1035	121.75	2645	122.25	3459	122	3600	117.15
3622	117.15	3624	120	3645	128	3660	128	3675	122
3804	122	3840	120	3945	120	4030	118	4038	114
4111	114	4135	118	4245	120	4296	124	4383	126
4607	130								

Manning's n Values num= 5

PatuxentRiver.rep

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	338	.035	394	.08	3459	.035	3660	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	338	394		208	212		.1	.3
Ineffective Flow		num=	1					
Sta L	Sta R	Elev	Permanent					
2780	4607	128	T					
Right Levee	Station=	3645	Elevation=	128				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.59	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.56	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	122.75	Flow Area (sq ft)	172.95	143.89
6162.34				
E.G. Slope (ft/ft)	0.001490	Area (sq ft)	172.95	143.89
8734.44				
Q Total (cfs)	8893.00	Flow (cfs)	132.86	442.39
8317.74				
Top Width (ft)	3409.44	Top Width (ft)	111.47	56.00
3241.97				
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.77	3.07
1.35				
Max Chl Dpth (ft)	10.56	Hydr. Depth (ft)	1.55	2.57
2.58				
Conv. Total (cfs)	230361.4	Conv. (cfs)	3441.6	11459.6
215460.2				
Length Wtd. (ft)	210.26	Wetted Per. (ft)	111.59	56.00
2386.00				
Min Ch El (ft)	121.98	Shear (lb/sq ft)	0.14	0.24
0.24				
Alpha	1.16	Stream Power (lb/ft s)	4607.00	0.00
3645.00				
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	10098.87	7796.87
15275.70				
C & E Loss (ft)	0.00	Cum SA (acres)	2389.99	697.98
3205.25				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

PatuxentRiver.rep

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	126.24	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	126.20	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	123.08	Flow Area (sq ft)	359.52	235.84
10080.31				
E.G. Slope (ft/ft)	0.000830	Area (sq ft)	359.52	235.84
14061.50				
Q Total (cfs)	15174.00	Flow (cfs)	326.75	752.19
14095.07				
Top Width (ft)	3418.06	Top Width (ft)	115.78	56.00
3246.28				
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	0.91	3.19
1.40				
Max Chl Dpth (ft)	12.20	Hydr. Depth (ft)	3.11	4.21
4.22				
Conv. Total (cfs)	526761.6	Conv. (cfs)	11343.1	26111.9
489306.7				
Length Wtd. (ft)	210.18	Wetted Per. (ft)	116.20	56.00
2386.00				
Min Ch El (ft)	121.98	Shear (lb/sq ft)	0.16	0.22
0.22				
Alpha	1.16	Stream Power (lb/ft s)	4607.00	0.00
3645.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	18210.17	10318.00
26214.70				
C & E Loss (ft)	0.00	Cum SA (acres)	2907.49	707.82
3716.98				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	128.34	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep				
Vel Head (ft) 0.080	0.05	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 210.00	128.29	Reach Len. (ft)	208.00	212.00
Crit W.S. (ft) 15575.01	123.58	Flow Area (sq ft)	607.40	352.96
E.G. Slope (ft/ft) 26858.69	0.000842	Area (sq ft)	607.40	352.96
Q Total (cfs) 24114.67	26361.00	Flow (cfs)	763.08	1483.25
Top Width (ft) 4117.40	4294.67	Top Width (ft)	121.27	56.00
Vel Total (ft/s) 1.55	1.59	Avg. Vel. (ft/s)	1.26	4.20
Max Chl Dpth (ft) 3.78	14.29	Hydr. Depth (ft)	5.01	6.30
Conv. Total (cfs) 831274.7	908709.6	Conv. (cfs)	26304.7	51130.3
Length Wtd. (ft) 4123.17	210.12	Wetted Per. (ft)	122.08	56.00
Min Ch El (ft) 0.20	121.98	Shear (lb/sq ft)	0.26	0.33
Alpha 3645.00	1.27	Stream Power (lb/ft s)	4607.00	0.00
Frctn Loss (ft) 33784.21	0.09	Cum Volume (acre-ft)	23657.61	11499.22
C & E Loss (ft) 4044.58	0.01	Cum SA (acres)	3223.44	707.52

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	128.51	Element	Left OB	Channel
Right OB				
Vel Head (ft) 0.080	0.12	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 210.00	128.39	Reach Len. (ft)	208.00	212.00
Crit W.S. (ft) 15957.17	124.15	Flow Area (sq ft)	618.66	358.15

PatuxentRiver.rep				
E.G. Slope (ft/ft)	0.001974	Area (sq ft)	618.66	358.15
27240.85				
Q Total (cfs)	41717.00	Flow (cfs)	1203.36	2327.76
38185.88				
Top Width (ft)	4300.11	Top Width (ft)	121.51	56.00
4122.60				
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	1.95	6.50
2.39				
Max Chl Dpth (ft)	14.39	Hydr. Depth (ft)	5.09	6.40
3.87				
Conv. Total (cfs)	938917.3	Conv. (cfs)	27083.9	52390.5
859442.9				
Length Wtd. (ft)	210.12	Wetted Per. (ft)	122.34	56.00
4128.36				
Min Ch El (ft)	121.98	Shear (lb/sq ft)	0.62	0.79
0.48				
Alpha	1.27	Stream Power (lb/ft s)	4607.00	0.00
3645.00				
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	34269.98	13648.58
47536.09				
C & E Loss (ft)	0.01	Cum SA (acres)	3618.27	709.31
4641.06				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196356.8

#### INPUT

Description: CG - old section 115 (Laurel study)

Station Elevation Data num= 133

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	162.4	29.52	160.86	54.12	160.51	98.41	158.32	113.17	156.97
123.01	156.92	201.73	153.7	226.33	152.47	246.01	152.38	270.61	150.96
305.06	147.46	324.93	143.28	344.81	136.17	379.6	127.21	404.44	122.5
419.35	120.57	434.26	122.26	449.17	122.91	473	123.5	479	116.34
510	115.42	539	116.55	542	123.32	608.47	123.35	623.44	122.54
638.41	123.27	653.39	122.07	678.34	122.13	738.23	121.74	753.21	121.96
853.03	121.87	887.97	122.32	912.92	121.75	947.86	121.74	982.8	120.86

PatuxentRiver.rep

1012.74	120.61	1122.55	120.59	1207.4	121.33	1237.34	120.32	1267.29	120.63
1297.24	120.36	1307.22	120.74	1367.11	120.32	1412.03	120.34	1436.99	120.93
1481.91	120.69	1501.87	120.08	1546.79	121.4	1571.75	120.27	1636.63	120.22
1686.54	120.59	1766.4	120.84	1776.38	120.47	1801.34	121.27	1821.3	120.89
1841.27	121.15	1871.21	120.85	1901.16	121.44	2005.97	121.75	2020.94	121
2040.91	121.08	2055.88	121.94	2085.83	121.58	2110.79	122.36	2140.73	121.88
2175.67	122.53	2195.64	121.18	2205.62	122.63	2215.6	122.79	2240.56	121.59
2250.54	120.38	2270.5	122.19	2290.47	122.3	2310.43	118.35	2330.4	122.99
2340.38	122.65	2365.34	123.36	2385.3	121.66	2410.26	124.13	2430.22	122.66
2440.21	123.12	2460.17	122.58	2480.14	122.79	2510.08	122.28	2545.02	122.14
2614.9	120.96	2649.84	121.21	2684.77	122	2734.69	120.83	2779.61	120.37
2804.56	120.78	2839.5	120.7	2859.47	121.24	2919.43	121.43	2959.42	120.95
3014.42	120.84	3054.42	121.1	3074.41	120.55	3094.41	121.05	3114.41	120.4
3139.41	121.08	3174.4	119.31	3189.4	119.39	3209.4	120.54	3239.4	121.07
3319.39	121.08	3329.39	120.92	3354.39	119	3369.38	120.02	3389.38	120.57
3419.38	119.33	3444.38	121.09	3479.37	122.88	3509.37	123.16	3580	122
3618	117.09	3668	117.09	3681	126.73	3711	126.73	3717	124
3723	122	3802	120	4003	118	4390	118	4420	116
4436	116	4539	118	4610	120	4633	122	4663	124
4692	126	4959	128	5128	130				

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	473	.035	542	.08	3580	.035	3723	.055

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
473	542	758.14	773.69	678.9		.1	.3

Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
2950	5128	124.6	T				
Right Levee	Station=	3699.35	Elevation=	126.73			

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.33	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	122.64	Flow Area (sq ft)	146.88	543.68
7070.90				
E.G. Slope (ft/ft)	0.000618	Area (sq ft)	146.88	543.68
9755.67				
Q Total (cfs)	8893.00	Flow (cfs)	82.32	2116.63
6694.05				
Top Width (ft)	3282.98	Top Width (ft)	78.22	69.00



PatuxentRiver.rep

3135.77				
Vel Total (ft/s)	1.15	Avg. Vel. (ft/s)	0.56	3.89
0.95				
Max Chl Dpth (ft)	8.91	Hydr. Depth (ft)	1.88	7.88
2.94				
Conv. Total (cfs)	357593.5	Conv. (cfs)	3310.3	85111.1
269172.1				
Length Wtd. (ft)	698.65	Wetted Per. (ft)	78.63	76.78
2409.90				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.07	0.27
0.11				
Alpha	3.26	Stream Power (lb/ft s)	5128.00	0.00
3699.35				
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	10098.10	7795.20
15231.13				
C & E Loss (ft)	0.02	Cum SA (acres)	2389.54	697.68
3189.88				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	126.11	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.035
0.079				
W.S. Elev (ft)	126.06	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	123.22	Flow Area (sq ft)	289.65	662.70
12279.04				
E.G. Slope (ft/ft)	0.000466	Area (sq ft)	289.65	662.70
15166.94				
Q Total (cfs)	15174.00	Flow (cfs)	205.84	2556.58
12411.57				
Top Width (ft)	3294.41	Top Width (ft)	87.31	69.00
3138.09				
Vel Total (ft/s)	1.15	Avg. Vel. (ft/s)	0.71	3.86
1.01				
Max Chl Dpth (ft)	10.64	Hydr. Depth (ft)	3.32	9.60
3.91				
Conv. Total (cfs)	702626.4	Conv. (cfs)	9531.5	118381.5

PatuxentRiver.rep

574713.3				
Length Wtd. (ft)	695.80	Wetted Per. (ft)	87.89	76.78
3143.65				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.10	0.25
0.11				
Alpha	2.55	Stream Power (lb/ft s)	5128.00	0.00
3699.35				
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	18208.62	10315.81
26144.25				
C & E Loss (ft)	0.01	Cum SA (acres)	2907.01	707.52
3701.59				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	128.25	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	128.21	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	123.92	Flow Area (sq ft)	489.55	811.53
22939.88				
E.G. Slope (ft/ft)	0.000269	Area (sq ft)	489.55	811.53
31486.20				
Q Total (cfs)	26361.00	Flow (cfs)	348.58	2722.93
23289.49				
Top Width (ft)	4601.29	Top Width (ft)	97.29	69.00
4435.00				
Vel Total (ft/s)	1.09	Avg. Vel. (ft/s)	0.71	3.36
1.02				
Max Chl Dpth (ft)	12.79	Hydr. Depth (ft)	5.03	11.76
5.17				
Conv. Total (cfs)	1606392.0	Conv. (cfs)	21241.8	165930.4
1419220.0				
Length Wtd. (ft)	693.04	Wetted Per. (ft)	98.11	76.78
4442.08				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.08	0.18
0.09				
Alpha	1.76	Stream Power (lb/ft s)	5128.00	0.00

PatuxentRiver.rep

3699.35				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	23654.99	11496.39
33643.58				
C & E Loss (ft)	0.00	Cum SA (acres)	3222.92	707.21
4023.97				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	128.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	128.18	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	124.59	Flow Area (sq ft)	486.70	809.50
22809.85				
E.G. Slope (ft/ft)	0.000686	Area (sq ft)	486.70	809.50
31356.17				
Q Total (cfs)	41717.00	Flow (cfs)	551.50	4328.69
36836.81				
Top Width (ft)	4598.70	Top Width (ft)	97.18	69.00
4432.52				
Vel Total (ft/s)	1.73	Avg. Vel. (ft/s)	1.13	5.35
1.61				
Max Chl Dpth (ft)	12.76	Hydr. Depth (ft)	5.01	11.73
5.15				
Conv. Total (cfs)	1592486.0	Conv. (cfs)	21052.8	165241.4
1406192.0				
Length Wtd. (ft)	693.04	Wetted Per. (ft)	97.99	76.78
4439.60				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.21	0.45
0.22				
Alpha	1.77	Stream Power (lb/ft s)	5128.00	0.00
3699.35				
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	34267.34	13645.74
47394.85				
C & E Loss (ft)	0.00	Cum SA (acres)	3617.75	709.00
4620.44				

Note: Multiple critical depths were found at this location. The critical depth

with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 195583.1

INPUT

Description: old section 114 (Laurel study)

Station Elevation Data num= 202

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	160.17	49.25	160.38	64.03	159.25	88.65	156.33	123.13	158.3
132.98	155.19	157.6	139.37	177.49	129.91	187.46	127.21	207.41	124.79
232.34	123.25	252.29	121.43	282.21	121.34	297.16	120.78	431.8	120.78
456.73	121.07	481.66	120.78	621.28	120.91	681.12	121.76	701.07	121.78
716.03	120.83	760.9	120.82	780.85	121.75	790.82	120.81	820.74	122.18
855.65	120.78	890.55	121.16	905.51	122.09	945.4	121.51	975	122.56
986	114.29	990	113.45	1011	116.56	1021	117.15	1025	122.19
1050.03	122.88	1069.98	122.61	1089.93	121.57	1099.9	121.92	1144.78	121.36
1159.74	120.47	1189.67	120.41	1249.51	119.49	1329.3	119.31	1359.22	118.64
1374.18	119.43	1399.12	119.09	1473.92	118.84	1498.86	119.48	1533.76	118.82
1563.69	119.42	1588.62	118.53	1708.31	118.56	1763.16	119.09	1778.12	119.9
1793.09	119.1	1808.05	119.92	1872.88	119.34	1907.78	120.12	1947.68	119.54
1997.55	120.61	2042.43	120.2	2082.33	121.24	2122.22	120.6	2137.18	121.48
2157.16	120.13	2172.16	120.76	2187.15	120.04	2222.14	121.48	2242.13	120.13
2267.13	121.3	2292.12	120.26	2312.11	120.01	2322.11	120.78	2357.09	118.1
2372.09	119.08	2387.08	116.83	2402.08	120.07	2412.08	120.91	2432.07	120.32
2442.07	121.1	2467.06	121.04	2472.06	122.15	2497.05	120.54	2507.04	121.34
2537.03	120.57	2552.03	117.27	2572.02	119.23	2587.02	119.51	2607.01	120.91
2627	120.86	2656.99	119.77	2666.99	120.06	2686.98	118.84	2696.98	119.33
2721.97	118.7	2736.97	119.5	2766.95	119.1	2796.94	119.52	2811.94	118.65
2871.92	119.06	2891.91	118.66	2951.89	118.55	3001.87	119.49	3036.86	118.42
3066.85	119.72	3091.84	118.88	3101.84	119.78	3146.82	117.77	3156.82	116.39
3176.81	118.14	3191.81	115.36	3211.8	116.71	3241.79	124.24	3261.79	126.66
3276.78	127.4	3296.77	127.38	3306.77	128.21	3331.76	126.48	3346.76	123.55
3361.75	122.74	3376.75	120.33	3401.74	119.59	3416.73	118.48	3486.71	118.52
3501.7	119.17	3541.69	119.58	3576.68	119.42	3671.65	117.37	3751.62	117.67
3816.6	117.58	3836.59	116.98	3911.56	116.86	3951.55	117.37	3981.54	116.74
4041.52	116.46	4056.51	116.07	4096.5	116.14	4111.49	116.8	4171.47	117.02
4201.46	117.64	4231.45	116.91	4251.44	117.81	4306.42	115.08	4366.39	115.21
4391.38	119.03	4401.38	119.83	4431.37	119.09	4451.36	116.54	4496.34	116.36
4516.34	117.87	4566.32	119.79	4576.31	119.62	4596.3	117.52	4626.29	117.43
4651.28	118.88	4726.25	118.91	4746.25	116.76	4756.24	116.5	4771.24	118.09
4811.22	119.08	4846.21	119.06	4866.2	117.49	4881.19	117.94	4896.19	115.7
5171.08	115.71	5211.06	118.19	5231.06	118.13	5261.04	122.11	5271.04	121
5291.03	121.02	5316.02	115.75	5331.02	115.72	5351.01	117.34	5371	119.9
5381	120.44	5400.99	119.71	5415.98	120.22	5445.97	119.89	5465.96	119.06

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5500.95	119.65	5520.94	117.73	5545.93	118.95	5570.92	121.87	5595.91	123.3
5630.9	122.18	5650.89	123.25	5660.89	122.02	5675.88	122.21	5685.88	123.62
5700.87	123.58	5720.87	125.34	5765.85	125.44	5835.82	125.1	5875.8	125.44
5905.79	128.97	5930.78	128.51	5950.78	129.12	5990.76	131.55	6010.75	133.37
6020.75	133.54	6050.74	136.2						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	975	.035	1025	.08	3146.82	.035	3416.73	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	975	1025		614.52	765.33		.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
3920	6050	121.8	T
3305	3920	116	T

Right Levee Station= 3306.77 Elevation= 128.21

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.035
0.073				
W.S. Elev (ft)	124.17	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	120.41	Flow Area (sq ft)	2230.78	387.80
10007.53				
E.G. Slope (ft/ft)	0.000169	Area (sq ft)	2230.78	387.80
10007.53				
Q Total (cfs)	8893.00	Flow (cfs)	884.12	781.13
7227.75				
Top Width (ft)	3023.98	Top Width (ft)	757.49	50.00
2216.50				
Vel Total (ft/s)	0.70	Avg. Vel. (ft/s)	0.40	2.01
0.72				
Max Chl Dpth (ft)	10.72	Hydr. Depth (ft)	2.94	7.76
4.52				
Conv. Total (cfs)	684830.4	Conv. (cfs)	68083.8	60153.4
556593.3				
Length Wtd. (ft)	649.86	Wetted Per. (ft)	757.83	55.53
2220.15				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.03	0.07
0.05				
Alpha	1.60	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	10077.41	7786.92

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15077.12  
 C & E Loss (ft) 0.00 Cum SA (acres) 2382.27 696.62  
 3148.17

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	125.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.074				
W.S. Elev (ft)	125.90	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	121.05	Flow Area (sq ft)	3562.13	474.40
13858.28				
E.G. Slope (ft/ft)	0.000169	Area (sq ft)	3562.13	474.40
13858.28				
Q Total (cfs)	15174.00	Flow (cfs)	1899.61	1094.73
12179.66				
Top Width (ft)	3057.21	Top Width (ft)	776.72	50.00
2230.49				
Vel Total (ft/s)	0.85	Avg. Vel. (ft/s)	0.53	2.31
0.88				
Max Chl Dpth (ft)	12.45	Hydr. Depth (ft)	4.59	9.49
6.21				
Conv. Total (cfs)	1166657.0	Conv. (cfs)	146052.1	84168.8
936435.9				
Length Wtd. (ft)	643.28	Wetted Per. (ft)	777.15	55.53
2234.25				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.05	0.09
0.07				
Alpha	1.45	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	18175.10	10305.71
25918.06				
C & E Loss (ft)	0.00	Cum SA (acres)	2899.49	706.46
3659.75				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	128.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	128.06	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	121.75	Flow Area (sq ft)	5260.60	582.60
18727.98				
E.G. Slope (ft/ft)	0.000193	Area (sq ft)	5260.60	582.60
18727.98				
Q Total (cfs)	26361.00	Flow (cfs)	3835.50	1645.09
20880.40				
Top Width (ft)	3120.67	Top Width (ft)	790.69	50.00
2279.99				
Vel Total (ft/s)	1.07	Avg. Vel. (ft/s)	0.73	2.82
1.11				
Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)	6.65	11.65
8.21				
Conv. Total (cfs)	1899464.0	Conv. (cfs)	276370.3	118538.6
1504555.0				
Length Wtd. (ft)	642.19	Wetted Per. (ft)	791.30	55.53
2283.84				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.08	0.13
0.10				
Alpha	1.35	Stream Power (lb/ft s)	6050.74	0.00
3306.77				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	23604.95	11484.01
33252.27				
C & E Loss (ft)	0.01	Cum SA (acres)	3215.19	706.16
3971.64				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

PatuxentRiver.rep				
		Element	Left OB	Channel
E.G. Elev (ft) Right OB	127.84			
Vel Head (ft) 0.075	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 638.85	127.77	Reach Len. (ft)	614.52	765.33
Crit W.S. (ft) 18068.50	122.39	Flow Area (sq ft)	5031.88	568.13
E.G. Slope (ft/ft) 18068.50	0.000544	Area (sq ft)	5031.88	568.13
Q Total (cfs) 33076.42	41717.00	Flow (cfs)	5989.94	2650.65
Top Width (ft) 2276.50	3116.11	Top Width (ft)	789.62	50.00
Vel Total (ft/s) 1.83	1.76	Avg. Vel. (ft/s)	1.19	4.67
Max Chl Dpth (ft) 7.94	14.32	Hydr. Depth (ft)	6.37	11.36
Conv. Total (cfs) 1418462.0	1789009.0	Conv. (cfs)	256874.8	113671.4
Length Wtd. (ft) 2280.34	642.32	Wetted Per. (ft)	790.20	55.53
Min Ch El (ft) 0.27	113.45	Shear (lb/sq ft)	0.22	0.35
Alpha 3306.77	1.37	Stream Power (lb/ft s)	6050.74	0.00
Frctn Loss (ft) 47009.70	0.11	Cum Volume (acre-ft)	34219.31	13633.51
C & E Loss (ft) 4568.16	0.02	Cum SA (acres)	3610.03	707.95

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 194817.8

#### INPUT

Description: old section 113.1 (Laurel study)

Station Elevation Data num= 201



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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	158.5	127	156	166	154	172	152	178	150
192	148	208	146	234	144	256	142	306	140
337	138	361	136	377	134	388	132	421	122
422.97	121.58	437.9	121.01	462.78	122.09	487.66	120.76	502.59	120.86
512.54	121.77	532.45	120.88	557.33	121.29	572.26	120.72	587.18	121.09
612.07	120.97	626.99	120.29	641.92	120.64	666.8	120.26	761.35	120.3
781.25	120.96	786.23	120.43	801.16	121.03	811.11	120.13	835.99	120.66
850	121.5	880	122.06	891	113.79	895	112.95	916	116.06
926	116.65	930	121.69	959	121.22	1030.32	120.44	1040.29	119.67
1060.23	120.22	1070.2	119.63	1100.11	119.4	1110.08	119.75	1135	119.4
1164.91	119.82	1189.84	119.35	1209.78	119.53	1229.72	118.62	1249.66	119.09
1299.51	119	1309.47	117.93	1334.4	118.04	1349.35	118.77	1384.25	117.48
1409.17	117.78	1444.07	117.38	1468.99	117.4	1493.91	117.92	1518.84	117.39
1543.76	117.39	1578.66	118.24	1613.55	117.98	1628.51	118.63	1663.41	119.08
1683.4	118.87	1703.39	119.27	1738.37	118.93	1768.36	118.27	1803.34	119
1838.32	118.41	1853.32	119.13	1883.3	119.16	1898.29	118.75	1923.28	117.23
1953.26	117.21	1988.25	117.67	2008.24	117.33	2023.23	118.67	2038.22	118.25
2063.21	119.52	2088.19	118.91	2098.19	119.57	2128.17	118.54	2158.16	116.38
2173.15	117.72	2198.13	115.33	2218.12	119.64	2233.12	123.9	2243.11	125.84
2258.1	125.15	2273.09	122.76	2288.09	118.99	2308.08	119.82	2333.06	118.92
2343.06	119.51	2358.05	118.42	2368.04	118.59	2378.04	117.5	2403.02	116.42
2413.02	113.77	2572.93	115.87	2577.93	116.52	2587.93	115.44	2602.92	117.4
2637.9	117.74	2652.89	117.16	2692.87	117.22	2702.86	116.72	2742.84	115.92
2752.84	113.77	2797.81	114.35	2807.81	117.19	2822.8	117.65	2847.79	116.41
2862.78	117.18	2877.77	116.99	2907.75	117.98	2932.74	118.01	2952.73	117.18
3022.69	116.46	3037.68	115.58	3042.68	116.2	3082.66	115.96	3112.64	119.95
3152.62	118.65	3182.61	117.15	3207.59	117.91	3242.57	115.94	3287.55	115.94
3307.54	116.28	3332.53	116.04	3377.5	116.06	3442.47	115.85	3607.38	115.9
3622.37	116.75	3632.36	116.57	3662.35	117.32	3682.34	117.05	3722.32	115.33
3742.3	113.55	3812.27	113.73	3817.26	115.05	3832.26	115.37	3862.24	115.05
3952.19	115.45	3962.19	115.01	4022.15	114.8	4102.11	114.82	4132.1	115.37
4207.06	115.05	4222.05	114.78	4247.04	115.15	4287.02	114.78	4376.98	114.79
4401.97	114.98	4446.94	114.89	4461.94	115.18	4501.92	117.84	4521.91	118.37
4541.9	117.79	4561.89	116.37	4586.88	115.7	4756.79	115.71	4766.79	116.11
4821.76	116.02	4866.74	116.61	4891.73	116.03	4921.71	116.1	4941.7	116.61
4961.69	116.04	5001.67	116.88	5051.65	116.96	5061.56	117.82	5081.4	122.54
5111.14	122.22	5135.93	123.38	5155.77	123.52	5185.51	124.56	5205.35	123.48
5235.09	125.62	5259.88	126.36	5314.42	126.83	5334.25	126.66	5349.13	127.73
5359.04	130.14	5378.88	136.27	5388.79	138.37	5408.62	141.4	5438.37	143.99
5458.2	146.12	5497.87	149.27	5522.66	148.34	5542.49	148.98	5577.2	153.93
5597.03	156.24								

Manning's n	Values	num=	5						
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	880	.035	930	.08	2173.15	.035	2413.02	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

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	880	930	862.16	963.36	666.85	.1	.3
Ineffective Flow		num=	2				
Sta L	Sta R	Elev	Permanent				
2275	4250	116	T				
4250	5100	121.2	T				
Right Levee		Station=	2243.11	Elevation=	125.84		

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.075				
W.S. Elev (ft)	124.01	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)	120.17	Flow Area (sq ft)	1453.01	405.05
6936.44				
E.G. Slope (ft/ft)	0.000282	Area (sq ft)	1453.01	405.05
6936.44				
Q Total (cfs)	8893.00	Flow (cfs)	773.17	1085.64
7034.19				
Top Width (ft)	1819.33	Top Width (ft)	465.64	50.00
1303.69				
Vel Total (ft/s)	1.01	Avg. Vel. (ft/s)	0.53	2.68
1.01				
Max Chl Dpth (ft)	11.06	Hydr. Depth (ft)	3.12	8.10
5.32				
Conv. Total (cfs)	529808.5	Conv. (cfs)	46062.4	64677.9
419068.2				
Length Wtd. (ft)	807.29	Wetted Per. (ft)	466.28	55.53
1305.50				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.05	0.13
0.09				
Alpha	1.68	Stream Power (lb/ft s)	5597.03	0.00
2243.11				
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	10051.43	7779.96
14952.87				
C & E Loss (ft)	0.02	Cum SA (acres)	2373.64	695.74
3122.36				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

PatuxentRiver.rep

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	125.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.00	Wt. n-Val.	0.100	0.035
0.059				
W.S. Elev (ft)	125.88	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)	120.80	Flow Area (sq ft)	2327.61	498.35
31944.67				
E.G. Slope (ft/ft)	0.000022	Area (sq ft)	2327.61	498.35
37217.79				
Q Total (cfs)	15174.00	Flow (cfs)	464.43	423.91
14285.66				
Top Width (ft)	4835.48	Top Width (ft)	471.79	50.00
4313.69				
Vel Total (ft/s)	0.44	Avg. Vel. (ft/s)	0.20	0.85
0.45				
Max Chl Dpth (ft)	12.93	Hydr. Depth (ft)	4.93	9.97
7.41				
Conv. Total (cfs)	3270565.0	Conv. (cfs)	100103.0	91368.2
3079094.0				
Length Wtd. (ft)	803.82	Wetted Per. (ft)	472.71	55.53
4319.64				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.01	0.01
0.01				
Alpha	1.10	Stream Power (lb/ft s)	5597.03	0.00
2243.11				
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	18133.56	10297.17
25543.52				
C & E Loss (ft)	0.02	Cum SA (acres)	2890.68	705.58
3611.77				

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

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E.G. Elev (ft) Right OB	128.04	Element	Left OB	Channel
Vel Head (ft) 0.059	0.01	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 666.85	128.04	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 41411.26	121.67	Flow Area (sq ft)	3354.49	606.36
E.G. Slope (ft/ft) 46684.38	0.000028	Area (sq ft)	3354.49	606.36
Q Total (cfs) 24723.85	26361.00	Flow (cfs)	965.54	671.61
Top Width (ft) 4420.39	4949.31	Top Width (ft)	478.92	50.00
Vel Total (ft/s) 0.60	0.58	Avg. Vel. (ft/s)	0.29	1.11
Max Chl Dpth (ft) 9.37	15.09	Hydr. Depth (ft)	7.00	12.13
Conv. Total (cfs) 4664362.0	4973224.0	Conv. (cfs)	182157.8	126704.2
Length Wtd. (ft) 4426.42	781.96	Wetted Per. (ft)	480.16	55.53
Min Ch El (ft) 0.02	112.95	Shear (lb/sq ft)	0.01	0.02
Alpha 2243.11	1.09	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 32772.61	0.07	Cum Volume (acre-ft)	23544.18	11473.56
C & E Loss (ft) 3922.50	0.04	Cum SA (acres)	3206.24	705.28

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	127.72	Element	Left OB	Channel
Vel Head (ft) 0.059	0.02	Wt. n-Val.	0.100	0.035

PatuxentRiver.rep

W.S. Elev (ft) 666.85	127.70	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 39925.27	122.49	Flow Area (sq ft)	3193.65	589.55
E.G. Slope (ft/ft) 45198.39	0.000080	Area (sq ft)	3193.65	589.55
Q Total (cfs) 39139.93	41717.00	Flow (cfs)	1498.99	1078.09
Top Width (ft) 4418.72	4946.54	Top Width (ft)	477.81	50.00
Vel Total (ft/s) 0.98	0.95	Avg. Vel. (ft/s)	0.47	1.83
Max Chl Dpth (ft) 9.04	14.75	Hydr. Depth (ft)	6.68	11.79
Conv. Total (cfs) 4389401.0	4678411.0	Conv. (cfs)	168105.9	120903.7
Length Wtd. (ft) 4424.72	784.81	Wetted Per. (ft)	479.00	55.53
Min Ch El (ft) 0.04	112.95	Shear (lb/sq ft)	0.03	0.05
Alpha 2243.11	1.09	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 46545.76	0.21	Cum Volume (acre-ft)	34161.29	13623.34
C & E Loss (ft) 4519.06	0.23	Cum SA (acres)	3601.09	707.07

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193854.4

INPUT

Description: old section 113 (Laurel study)

Station Elevation Data num= 119

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138	92	136	181	134	271	132	337	130

PatuxentRiver.rep

466	128	603	126	697	124	699.36	123.38	709.36	123.8
739.33	122.42	754.32	120.36	764.31	120.19	809.27	120.22	849.23	120.73
864.22	120.29	899.18	120.26	914.17	120.95	934.15	120.21	974.12	120.23
984.11	119.72	1009.08	120.09	1044.05	119.61	1079.02	119.99	1094.01	119.7
1108.99	118.59	1118.99	119.29	1138.97	119.68	1163.94	119.5	1188.92	118.52
1218.89	118.54	1228.89	119.34	1253.86	118.71	1273.85	118.69	1283.84	119.39
1298.82	119	1308.81	119.37	1328.8	119.18	1338.79	118.7	1383.75	118.57
1393.74	119.23	1403.73	118.55	1433.7	118.29	1453.68	118.49	1463.67	118.21
1488.65	118.45	1503.64	118.03	1523.62	118.46	1538.61	118.11	1598.55	117.93
1648.51	117.93	1688.47	118.8	1708.45	118.15	1733.43	118.89	1757	118.94
1762	114.31	1769	112.35	1781	112.3	1802	114.36	1807	118.94
1823.35	119.89	1838.33	123.63	1858.31	127.16	1878.29	128.41	1883.28	128.17
1918.23	123.82	1948.19	117.03	1953.19	117.63	1973.16	117.14	1978.15	117.69
1998.13	118.23	2028.09	118.44	2063.04	118.1	2078.02	117.08	2098	117.99
2112.98	117.16	2127.96	117.7	2147.93	117.02	2187.88	116.89	2212.84	117.05
2227.82	117.53	2262.78	117.08	2272.77	117.19	2312.71	116.42	2337.68	116.4
2352.66	116.73	2397.6	116.54	2407.59	117.08	2422.57	116.17	2472.5	116
2482.49	113.84	2487.48	113.77	2572.37	114.39	2577.36	115.52	2597.34	115.49
2612.32	118.5	2632.29	117.68	2642.28	118.47	2652.26	118.18	2662.25	118.95
2672.24	118.85	2692.21	115.91	2699	114	2729	114	2737	116
3817	116	3832	118	3840	118	3847	116	4310	116
4420	118	4622	118	5067	118	5124	120	5148	122
5300	124	5330	126	5412	126	5419	127		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1757	.035	1807	.08	2187.88	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1757	1807		512.6	496.5	483.9	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
4850	5200	120.94	T
1900	4300	116	T

Right Levee Station= 1878.29 Elevation= 128.41

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	123.60	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.24	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	123.36	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	121.50	Flow Area (sq ft)	4267.90	480.63
88.70				
E.G. Slope (ft/ft)	0.001229	Area (sq ft)	4267.90	480.63

PatuxentRiver.rep

88.70				
Q Total (cfs)	8893.00	Flow (cfs)	5702.78	3073.11
117.11				
Top Width (ft)	1118.41	Top Width (ft)	1038.15	50.00
30.26				
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	1.34	6.39
1.32				
Max Chl Dpth (ft)	11.06	Hydr. Depth (ft)	4.11	9.61
2.93				
Conv. Total (cfs)	253708.7	Conv. (cfs)	162694.8	87672.8
3341.1				
Length Wtd. (ft)	504.28	Wetted Per. (ft)	1038.65	53.97
30.71				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.32	0.68
0.22				
Alpha	4.53	Stream Power (lb/ft s)	5419.00	0.00
1878.29				
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	9994.81	7770.17
14899.09				
C & E Loss (ft)	0.11	Cum SA (acres)	2358.76	694.64
3112.15				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	125.44	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.28	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.16	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	122.42	Flow Area (sq ft)	6196.07	570.34
151.37				
E.G. Slope (ft/ft)	0.001355	Area (sq ft)	6196.07	570.34
151.37				

PatuxentRiver.rep

Q Total (cfs) 248.86	15174.00	Flow (cfs)	10632.69	4292.45
Top Width (ft) 39.97	1204.35	Top Width (ft)	1114.38	50.00
Vel Total (ft/s) 1.64	2.19	Avg. Vel. (ft/s)	1.72	7.53
Max Chl Dpth (ft) 3.79	12.86	Hydr. Depth (ft)	5.56	11.41
Conv. Total (cfs) 6760.6	412221.5	Conv. (cfs)	288851.0	116609.9
Length Wtd. (ft) 40.59	505.57	Wetted Per. (ft)	1114.99	53.97
Min Ch El (ft) 0.32	112.30	Shear (lb/sq ft)	0.47	0.89
Alpha 1878.29	3.77	Stream Power (lb/ft s)	5419.00	0.00
Frctn Loss (ft) 25257.48	1.14	Cum Volume (acre-ft)	18049.21	10285.35
C & E Loss (ft) 3578.44	0.15	Cum SA (acres)	2874.98	704.48

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	127.94	Element	Left OB	Channel
Vel Head (ft) 0.080	0.36	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	127.58	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 265.72	123.67	Flow Area (sq ft)	9060.36	691.46
E.G. Slope (ft/ft) 265.72	0.001525	Area (sq ft)	9060.36	691.46
Q Total (cfs)	26361.00	Flow (cfs)	19557.20	6277.14



PatuxentRiver.rep

526.66				
Top Width (ft)	1370.21	Top Width (ft)	1262.20	50.00
58.02				
Vel Total (ft/s)	2.63	Avg. Vel. (ft/s)	2.16	9.08
1.98				
Max Chl Dpth (ft)	15.28	Hydr. Depth (ft)	7.18	13.83
4.58				
Conv. Total (cfs)	675039.6	Conv. (cfs)	500811.2	160742.0
13486.5				
Length Wtd. (ft)	506.50	Wetted Per. (ft)	1262.83	53.97
58.83				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.68	1.22
0.43				
Alpha	3.34	Stream Power (lb/ft s)	5419.00	0.00
1878.29				
Frctn Loss (ft)	1.36	Cum Volume (acre-ft)	23421.32	11459.21
32413.23				
C & E Loss (ft)	0.21	Cum SA (acres)	3189.01	704.17
3888.23				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	127.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.28	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.99	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	124.99	Flow Area (sq ft)	6013.12	562.10
144.86				
E.G. Slope (ft/ft)	0.011083	Area (sq ft)	6013.12	562.10
144.86				
Q Total (cfs)	41717.00	Flow (cfs)	29062.67	11982.37
671.96				

PatuxentRiver.rep				
Top Width (ft) 39.04	1195.68	Top Width (ft)	1106.64	50.00
Vel Total (ft/s) 4.64	6.21	Avg. Vel. (ft/s)	4.83	21.32
Max Chl Dpth (ft) 3.71	12.69	Hydr. Depth (ft)	5.43	11.24
Conv. Total (cfs) 6382.8	396255.9	Conv. (cfs)	276056.6	113816.6
Length Wtd. (ft) 39.65	497.13	Wetted Per. (ft)	1107.25	53.97
Min Ch El (ft) 2.53	112.30	Shear (lb/sq ft)	3.76	7.21
Alpha 1878.29	3.82	Stream Power (lb/ft s)	5419.00	0.00
Frctn Loss (ft) 46198.69	0.30	Cum Volume (acre-ft)	34070.18	13610.60
C & E Loss (ft) 4484.94	0.67	Cum SA (acres)	3585.41	705.96

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1 RS: 193357.9

#### INPUT

Description:

PatuxentRiver.rep

Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148	32	138	47	136	97	134	180	132
277	130	374	128	517	126	643	124	839	124
1047	124	1067	120	1199	120	1288	120	1424	118
1663	118	1840	118	1850	112.6	1900	112.6	1905	118
1920	124	1940	124	1955	122	1992	120	2041	118
2083	116	2100	114	2343	114	2357	116	3090	116
3581	114	3671	114	4170	116	4254	118	4471	118
4818	118	4862	120	4968	122	5101	122	5132	124
5228	124	5247	126	5267	128				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1840	.03	1905	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1840	1905	178.5	181.3	183.7	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
4825	5267	124	T
1940	4254	116	T

Right Levee Station= 1920 Elevation= 124.1

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	122.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.33	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	121.18	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	119.99	Flow Area (sq ft)	1883.07	517.15
12.63				
E.G. Slope (ft/ft)	0.003553	Area (sq ft)	1883.07	517.15
12.63				
Q Total (cfs)	8893.00	Flow (cfs)	3003.83	5862.80
26.37				
Top Width (ft)	851.84	Top Width (ft)	778.90	65.00
7.95				
Vel Total (ft/s)	3.69	Avg. Vel. (ft/s)	1.60	11.34
2.09				
Max Chl Dpth (ft)	8.58	Hydr. Depth (ft)	2.42	7.96
1.59				
Conv. Total (cfs)	149202.8	Conv. (cfs)	50396.9	98363.5
442.5				
Length Wtd. (ft)	180.26	Wetted Per. (ft)	779.03	68.72

PatuxentRiver.rep

8.56				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.54	1.67
0.33				
Alpha	6.30	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	9958.62	7764.48
14898.53				
C & E Loss (ft)	0.06	Cum SA (acres)	2348.06	693.98
3111.94				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	124.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.74	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	122.41	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	122.41	Flow Area (sq ft)	2847.39	597.31
24.34				
E.G. Slope (ft/ft)	0.004509	Area (sq ft)	2847.39	597.31
24.34				
Q Total (cfs)	15174.00	Flow (cfs)	6705.08	8397.71
71.21				
Top Width (ft)	861.09	Top Width (ft)	785.06	65.00
11.03				
Vel Total (ft/s)	4.37	Avg. Vel. (ft/s)	2.35	14.06
2.93				
Max Chl Dpth (ft)	9.81	Hydr. Depth (ft)	3.63	9.19
2.21				
Conv. Total (cfs)	225982.2	Conv. (cfs)	99856.9	125064.7
1060.5				
Length Wtd. (ft)	179.97	Wetted Per. (ft)	785.32	68.72
11.88				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	1.02	2.45
0.58				
Alpha	5.85	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.93	Cum Volume (acre-ft)	17995.99	10278.70
25256.51				
C & E Loss (ft)	0.10	Cum SA (acres)	2863.81	703.82
3578.16				

PatuxentRiver.rep

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	126.37	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.44	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	123.93	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	123.93	Flow Area (sq ft)	4044.30	695.93
43.95				
E.G. Slope (ft/ft)	0.005951	Area (sq ft)	4044.30	695.93
43.95				
Q Total (cfs)	26361.00	Flow (cfs)	13734.85	12446.23
179.93				
Top Width (ft)	872.47	Top Width (ft)	792.65	65.00
14.82				
Vel Total (ft/s)	5.51	Avg. Vel. (ft/s)	3.40	17.88
4.09				
Max Chl Dpth (ft)	11.33	Hydr. Depth (ft)	5.10	10.71
2.96				
Conv. Total (cfs)	341720.8	Conv. (cfs)	178046.5	161341.9
2332.4				
Length Wtd. (ft)	182.98	Wetted Per. (ft)	793.05	68.72
15.97				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	1.89	3.76
1.02				
Alpha	5.18	Stream Power (lb/ft s)	5267.00	0.00
1920.00				
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	23344.22	11451.30
32411.51				

C & E Loss (ft) 0.01 Cum SA (acres) 3176.92 703.52  
 3887.82

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.10	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.030
0.055				
W.S. Elev (ft)	125.06	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	123.93	Flow Area (sq ft)	5399.11	769.14
24933.14				
E.G. Slope (ft/ft)	0.000196	Area (sq ft)	5399.11	769.14
27414.25				
Q Total (cfs)	41717.00	Flow (cfs)	2959.44	2670.78
36086.78				
Top Width (ft)	4661.56	Top Width (ft)	1263.53	65.00
3333.03				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	0.55	3.47
1.45				
Max Chl Dpth (ft)	12.46	Hydr. Depth (ft)	4.27	11.83
7.48				
Conv. Total (cfs)	2977258.0	Conv. (cfs)	211209.5	190607.9
2575441.0				
Length Wtd. (ft)	183.00	Wetted Per. (ft)	1263.95	68.72

PatuxentRiver.rep

3335.14					
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.05	0.14	
0.09					
Alpha	1.45	Stream Power (lb/ft s)	5267.00	0.00	
1920.00					
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	34003.03	13603.02	
46045.61					
C & E Loss (ft)	0.00	Cum SA (acres)	3571.47	705.31	
4466.21					

Warning: Multiple water surfaces were found that could balance the energy equation. The program selected the water surface whose main channel velocity head was the closest to the previously computed cross section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193176.6

INPUT

Description: old section 112.5 (Laurel study)

Station Elevation Data		num= 195							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	146.75	112	146	235	144	264	142	279	140
290	138	300	136	309	134	315	132	322	130
334	128	337.57	127.93	367.35	126.31	387.21	126.98	441.82	125.28
461.77	124.23	501.72	124.18	561.65	123.02	571.63	122.47	601.6	122.56
661.53	121.87	676.51	122.15	696.49	121.88	726.45	122.76	746.43	122.24
761.41	122.69	781.39	120.89	791.37	122.25	816.34	121.36	851.3	122.07
866.29	121.75	911.23	118.89	936.2	118.92	956.18	118.41	1031.09	118.42
1041.08	118.84	1071.04	118.7	1081.03	119.27	1110.99	118.78	1145.95	118.88
1175.92	119.72	1215.87	120.16	1235.84	119.28	1260.81	119.56	1290.78	118.95
1315.75	119.76	1335.72	118.88	1345.71	119.27	1385.67	118.35	1395.65	118.62
1430.61	118.25	1460.58	118.59	1480.55	118.06	1505.52	118.1	1520.5	117.66
1570.44	117.22	1595.41	117.78	1610.4	117.02	1635.37	117.3	1645.35	116.69
1675.32	117.59	1690.3	116.82	1710.28	116.77	1725.26	117.56	1760.22	116.41
1770.2	116.4	1790.18	117.47	1820	117.2	1824	112.5	1850	112.3
1876	112.5	1880	117.2	1895.06	121.89	1905.04	122.59	1920.03	121.13
1935.01	121.16	1949.99	122.01	1989.94	122.09	2009.92	120.5	2024.9	118.03
2034.88	117.16	2059.85	116.95	2069.83	117.37	2094.8	119.56	2104.78	119.96
2129.75	119.3	2144.72	119.42	2164.69	118.33	2174.68	118.43	2209.63	116.85
2234.59	116.14	2249.57	116.56	2264.55	115.94	2289.51	115.64	2304.49	116.02

PatuxentRiver.rep

2319.47	115.06	2339.44	114.72	2354.42	112.77	2364.4	113.95	2384.37	114.04
2404.34	115.83	2449.28	115.95	2464.25	114.94	2489.22	116.46	2504.2	116.77
2524.17	115.72	2539.14	113.94	2574.09	112.49	2584.08	114.35	2614.03	114.58
2624.02	114.99	2668.95	115.22	2703.9	115.66	2733.86	114.78	2748.84	115.5
2788.78	114.49	2808.75	115.13	2833.71	114.9	2883.64	115.17	2913.6	114.73
2918.59	115.12	2948.54	114.21	2968.51	114.54	2983.49	112.71	2988.49	113.47
3023.43	114.11	3038.41	113.55	3223.14	113.92	3243.11	113.8	3253.1	115.26
3273.07	115.2	3283.05	114.36	3313.01	114.14	3357.94	115.47	3382.91	115.54
3407.87	113.55	3557.65	113.86	3577.62	114.9	3607.58	115.65	3637.53	115.67
3662.5	116.3	3707.43	116.75	3732.39	116.12	3757.36	116.26	3787.31	117.51
3802.29	117.49	3837.24	116.06	3862.2	116.99	3887.17	116.7	3927.11	119.46
3952.07	120.58	3982.03	121.01	3992.01	120.66	4002	118.94	4016.98	120.45
4061.91	119.32	4146.79	120.49	4166.76	120.33	4186.73	121.14	4231.66	121.14
4251.63	120.83	4306.55	121.06	4341.5	120.85	4366.46	120.05	4421.38	119.82
4446.35	121.46	4506.26	122.52	4571.16	120.64	4596.13	122.86	4616.1	123.87
4656.04	124.39	4666.02	124.21	4690.97	122.17	4700.91	122.22	4715.83	123.72
4750.65	124.86	4765.57	124.29	4780.48	122.94	4800.38	123.75	4835.19	124.2
4855.08	126.17	4870	125.12	4879.95	125.85	4899.84	125.73	4934.65	126.69
4949.57	125.9	4964.49	126.01	4989.36	128.45	5024.17	130.54	5058.98	131.03
5118.66	135.64	5168.39	140.34	5193.26	141.03	5252.93	145.46	5282.77	146.72

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1820	.035	1880	.055

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1820	1880		391.5	401.9		.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
1920	3700	116	T
3935	5200	140	T

Right Levee Station= 1905.04 Elevation= 122.59

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	121.71	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.12	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	120.59	Reach Len. (ft)	391.50	401.90
417.60				
Crit W.S. (ft)	120.59	Flow Area (sq ft)	2087.20	471.54
18.40				
E.G. Slope (ft/ft)	0.004741	Area (sq ft)	2087.20	471.54
18.40				
Q Total (cfs)	8893.00	Flow (cfs)	3645.42	5200.43
47.15				



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Top Width (ft) 10.87	1006.29	Top Width (ft)	935.41	60.00
Vel Total (ft/s) 2.56	3.45	Avg. Vel. (ft/s)	1.75	11.03
Max Chl Dpth (ft) 1.69	8.29	Hydr. Depth (ft)	2.23	7.86
Conv. Total (cfs) 684.8	129159.2	Conv. (cfs)	52944.9	75529.5
Length Wtd. (ft) 11.39	404.75	Wetted Per. (ft)	935.77	64.34
Min Ch El (ft) 0.48	112.30	Shear (lb/sq ft)	0.66	2.17
Alpha 1905.04	6.08	Stream Power (lb/ft s)	5282.77	0.00
Frctn Loss (ft) 14898.47	1.03	Cum Volume (acre-ft)	9950.49	7762.42
C & E Loss (ft) 3111.90	0.30	Cum SA (acres)	2344.55	693.72

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	123.06	Element	Left OB	Channel
Vel Head (ft) 0.055	1.41	Wt. n-Val.	0.100	0.035
W.S. Elev (ft)	121.64	Reach Len. (ft)	391.50	401.90

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417.60				
Crit W.S. (ft)	121.64	Flow Area (sq ft)	3095.06	535.08
31.72				
E.G. Slope (ft/ft)	0.006046	Area (sq ft)	3095.06	535.08
31.72				
Q Total (cfs)	15174.00	Flow (cfs)	7813.94	7250.04
110.02				
Top Width (ft)	1062.25	Top Width (ft)	987.98	60.00
14.27				
Vel Total (ft/s)	4.14	Avg. Vel. (ft/s)	2.52	13.55
3.47				
Max Chl Dpth (ft)	9.34	Hydr. Depth (ft)	3.13	8.92
2.22				
Conv. Total (cfs)	195155.6	Conv. (cfs)	100496.5	93244.1
1415.0				
Length Wtd. (ft)	403.91	Wetted Per. (ft)	988.46	64.34
14.95				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	1.18	3.14
0.80				
Alpha	5.30	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)	17983.82	10276.34
25256.39				
C & E Loss (ft)	0.39	Cum SA (acres)	2860.17	703.56
3578.10				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	122.65	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	122.59	Reach Len. (ft)	391.50	401.90
417.60				
Crit W.S. (ft)	122.59	Flow Area (sq ft)	4132.74	591.80
12042.18				
E.G. Slope (ft/ft)	0.000401	Area (sq ft)	4132.74	591.80
15233.57				
Q Total (cfs)	26361.00	Flow (cfs)	2988.32	2209.35
21163.34				
Top Width (ft)	4025.65	Top Width (ft)	1233.79	60.00
2731.85				
Vel Total (ft/s)	1.57	Avg. Vel. (ft/s)	0.72	3.73
1.76				
Max Chl Dpth (ft)	10.29	Hydr. Depth (ft)	3.35	9.86
5.86				
Conv. Total (cfs)	1315960.0	Conv. (cfs)	149178.8	110292.2
1056489.0				
Length Wtd. (ft)	411.83	Wetted Per. (ft)	1234.41	64.34
2057.85				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.08	0.23
0.15				
Alpha	1.50	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	23327.46	11448.62
32379.30				
C & E Loss (ft)	0.01	Cum SA (acres)	3172.76	703.26
3882.03				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

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water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.05	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	124.99	Reach Len. (ft)	391.50	401.90
417.60				
Crit W.S. (ft)	122.59	Flow Area (sq ft)	7264.22	735.55
16965.54				
E.G. Slope (ft/ft)	0.000313	Area (sq ft)	7264.22	735.55
22032.55				
Q Total (cfs)	41717.00	Flow (cfs)	5800.70	2805.07
33111.23				
Top Width (ft)	4395.72	Top Width (ft)	1372.59	60.00
2963.12				
Vel Total (ft/s)	1.67	Avg. Vel. (ft/s)	0.80	3.81
1.95				
Max Chl Dpth (ft)	12.69	Hydr. Depth (ft)	5.29	12.26
8.26				
Conv. Total (cfs)	2356715.0	Conv. (cfs)	327698.2	158466.6
1870550.0				
Length Wtd. (ft)	411.31	Wetted Per. (ft)	1373.26	64.34
2057.85				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.10	0.22
0.16				
Alpha	1.46	Stream Power (lb/ft s)	5282.77	0.00
1905.04				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	33977.09	13599.88
45941.35				
C & E Loss (ft)	0.00	Cum SA (acres)	3566.07	705.05
4452.93				

CROSS SECTION

RIVER: Patuxent River  
REACH: 1

RS: 192774.7

INPUT  
Description:

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Station Elevation Data		num= 33							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	145	134	144	193	142	237	130	249	128
351	126	434	124	559	122	715	120	738	118
1386	118	1603	116	1621	116	1807	118	1855	118
1870	112.35	1922	112.35	1924	118	2104	118	2480	116
2591	116	2752	114	2775	112.52	2800	112.39	2816	114
2860	114	3260	116	3717	118	3834	120	4191	122
4463	124	4637	126	4984	127				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1855	.035	1924	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	1855	1924		261.34	259.8	275.16	.1	.3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.82	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	118.71	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	1236.04	390.88
4528.05				
E.G. Slope (ft/ft)	0.001584	Area (sq ft)	1236.04	390.88
4528.05				
Q Total (cfs)	8893.00	Flow (cfs)	778.13	2002.58
6112.28				
Top Width (ft)	3028.77	Top Width (ft)	1125.18	69.00
1834.59				
Vel Total (ft/s)	1.44	Avg. Vel. (ft/s)	0.63	5.12
1.35				
Max Chl Dpth (ft)	6.36	Hydr. Depth (ft)	1.10	5.66
2.47				
Conv. Total (cfs)	223468.7	Conv. (cfs)	19553.4	50322.2
153593.1				
Length Wtd. (ft)	270.08	Wetted Per. (ft)	1125.23	74.02
1834.75				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.11	0.52
0.24				
Alpha	3.45	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	9935.55	7758.44
14876.67				

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C & E Loss (ft)	0.01	Cum SA (acres)	2335.29	693.13
3103.05				

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.75	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	119.63	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	2272.51	454.14
6234.70				
E.G. Slope (ft/ft)	0.001637	Area (sq ft)	2272.51	454.14
6234.70				
Q Total (cfs)	15174.00	Flow (cfs)	2169.56	2614.65
10389.80				
Top Width (ft)	3092.95	Top Width (ft)	1135.72	69.00
1888.23				
Vel Total (ft/s)	1.69	Avg. Vel. (ft/s)	0.95	5.76
1.67				
Max Chl Dpth (ft)	7.28	Hydr. Depth (ft)	2.00	6.58
3.30				
Conv. Total (cfs)	374998.0	Conv. (cfs)	53616.6	64616.3
256765.1				
Length Wtd. (ft)	270.15	Wetted Per. (ft)	1135.81	74.02
1888.40				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.20	0.63
0.34				
Alpha	2.70	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	17959.70	10271.78
25226.35				
C & E Loss (ft)	0.01	Cum SA (acres)	2850.63	702.96
3568.99				

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.46	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.080				

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W.S. Elev (ft) 275.16	121.35	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 9685.01		Flow Area (sq ft)	4307.43	573.05
E.G. Slope (ft/ft) 9685.01	0.001297	Area (sq ft)	4307.43	573.05
Q Total (cfs) 17661.53	26361.00	Flow (cfs)	5270.99	3428.48
Top Width (ft) 2151.17	3465.55	Top Width (ft)	1245.38	69.00
Vel Total (ft/s) 1.82	1.81	Avg. Vel. (ft/s)	1.22	5.98
Max Chl Dpth (ft) 4.50	9.00	Hydr. Depth (ft)	3.46	8.31
Conv. Total (cfs) 490454.4	732035.6	Conv. (cfs)	146373.4	95207.8
Length Wtd. (ft) 2151.35	269.98	Wetted Per. (ft)	1245.50	74.02
Min Ch El (ft) 0.36	112.35	Shear (lb/sq ft)	0.28	0.63
Alpha 0.00	2.19	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 32259.85	0.39	Cum Volume (acre-ft)	23289.54	11443.25
C & E Loss (ft) 3858.62	0.00	Cum SA (acres)	3161.62	702.66

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.89	Element	Left OB	Channel
Vel Head (ft) 0.080	0.06	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 275.16	124.82	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 18048.18		Flow Area (sq ft)	9035.10	812.73
E.G. Slope (ft/ft) 18048.18	0.000514	Area (sq ft)	9035.10	812.73
Q Total (cfs) 27573.88	41717.00	Flow (cfs)	10279.44	3863.68
Top Width (ft) 2610.75	4134.98	Top Width (ft)	1455.23	69.00
Vel Total (ft/s) 1.53	1.50	Avg. Vel. (ft/s)	1.14	4.75

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Max Chl Dpth (ft) 6.91	12.47	Hydr. Depth (ft)	6.21	11.78
Conv. Total (cfs) 1216454.0	1840395.0	Conv. (cfs)	453489.5	170450.7
Length Wtd. (ft) 2610.95	269.94	Wetted Per. (ft)	1455.37	74.02
Min Ch El (ft) 0.22	112.35	Shear (lb/sq ft)	0.20	0.35
Alpha 0.00	1.77	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 45749.23	0.14	Cum Volume (acre-ft)	33903.84	13592.74
C & E Loss (ft) 4426.21	0.00	Cum SA (acres)	3553.36	704.45

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 192514.9

INPUT

Description: old section 112 (Laurel study)

Station Elevation Data		num= 190							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	139	65	138	142	136	163	134	170	132
177	130	204	128	319	126	399	124	526	122
684	120	705	118	707.59	117.54	742.56	117.03	762.54	118.1
802.51	117.21	832.49	118.36	857.47	117.42	997.35	117.29	1052.31	118.31
1147.23	117.82	1157.22	118.6	1187.19	117.69	1212.17	118.69	1222.17	117.85
1247.14	118.34	1287.11	118.23	1302.1	117.01	1327.08	117.48	1337.07	116.52
1362.05	117.51	1431.99	116.62	1461.97	116.62	1481.95	117.38	1506.93	116.21
1571.87	116.11	1591.86	115.72	1691.77	115.69	1711.76	116.49	1746.73	116.12
1776.7	117.11	1801.68	116.6	1846.65	116.61	1881.62	117.31	1901.6	118.29
1945	115.4	1949	112.7	1976	112.4	2004	112.7	2008	115.4
2041.51	118.09	2071.5	117.1	2116.49	117.82	2146.49	116.41	2211.47	116.67
2221.47	116.13	2291.46	116.27	2336.45	116.01	2361.44	116.87	2381.44	116.43
2391.44	113.98	2411.43	116.67	2436.43	116.01	2456.43	116.27	2466.42	115.19
2566.4	115.56	2611.4	115.26	2621.39	115.92	2646.39	115.09	2706.38	114.72
2726.37	115.04	2746.37	114.17	2756.37	112.1	2776.36	114.74	2791.36	115.55
2806.36	113.73	2846.35	115.38	2956.33	114.19	3021.32	114.21	3066.31	114.15
3131.29	114.62	3206.28	114.19	3271.27	114.87	3296.26	114.76	3321.26	115.87
3331.25	115.16	3406.24	117.36	3426.24	116.85	3446.23	119.97	3461.23	116.5
3471.23	115.96	3501.22	116.4	3561.21	118.51	3596.2	118.71	3676.19	118.04
3696.18	117.21	3721.18	118.76	3731.18	117.97	3761.17	119.47	3806.16	118.94
3831.16	119.56	3861.15	117.97	3881.15	118.66	3906.14	117.57	3936.14	118.4



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3956.13	118.07	3966.13	119.13	3976.13	117.79	3986.13	118.5	4036.12	118.05
4051.11	119.44	4061.11	117.9	4071.11	119.08	4086.11	118.43	4096.11	119.6
4111.1	118.44	4121.1	119.37	4146.1	118.37	4176.09	118.88	4231.08	122.1
4236.08	121.85	4271.07	123.99	4291.07	120.83	4311.06	121.73	4346.06	121.3
4361.05	120.43	4426.04	120.66	4441.04	119.54	4466.03	121.43	4486.03	120.49
4506.03	122.15	4531.02	121.87	4551.02	118.67	4576.01	117.96	4596.01	119.11
4611	118.42	4631	122.24	4665.99	121.95	4690.99	122.87	4705.99	122.25
4715.98	123.69	4725.98	121.32	4765.97	121.73	4780.97	122.9	4790.97	122.16
4810.97	122.84	4885.95	122.86	4945.94	124.68	4970.93	124.31	4990.93	125.76
5000.93	124.44	5020.92	126.77	5035.92	124.7	5080.91	126.06	5090.91	127.46
5105.91	126.19	5130.9	125.78	5165.9	123.64	5195.89	124.26	5210.89	122.4
5230.88	125.89	5250.88	125.71	5260.88	124.46	5270.88	127.18	5295.87	128.91
5340.86	129.11	5350.86	130.4	5375.86	129.38	5405.85	130.62	5420.85	130.54
5495.83	132.49	5560.82	133	5590.81	131.67	5605.81	132.35	5635.8	136.11
5700.79	137.58	5745.78	136.95	5760.78	136.17	5870.76	139.47	5900.75	139.37
5925.75	140.04	5940.75	139.54	5970.74	140.29	5995.73	139.44	6015.73	140.03
6055.72	140.11	6080.72	139.06	6110.71	140.59	6150.7	139.42	6170.7	141.7

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1	1945 .035	2008 .1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1945	2008	640.52	833.38	848.74	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
4100	6170.7	130	F				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.18	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.10	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	116.87	Flow Area (sq ft)	1199.73	337.34
3937.69				
E.G. Slope (ft/ft)	0.002582	Area (sq ft)	1199.73	337.34
3938.17				
Q Total (cfs)	8893.00	Flow (cfs)	1100.68	2189.36
5602.96				
Top Width (ft)	2757.59	Top Width (ft)	1067.50	63.00
1627.09				
Vel Total (ft/s)	1.62	Avg. Vel. (ft/s)	0.92	6.49
1.42				
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)	1.12	5.35

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2.43				
Conv. Total (cfs)	175001.1	Conv. (cfs)	21659.7	43083.4
110258.0				
Length Wtd. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66
1621.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84
0.39				
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27
14849.93				
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73
3092.12				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.20	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.96	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	117.78	Flow Area (sq ft)	2253.03	392.13
5529.78				
E.G. Slope (ft/ft)	0.002836	Area (sq ft)	2253.03	392.13
5576.99				
Q Total (cfs)	15174.00	Flow (cfs)	2639.22	2948.16
9586.61				
Top Width (ft)	3399.87	Top Width (ft)	1250.13	63.00
2086.74				
Vel Total (ft/s)	1.86	Avg. Vel. (ft/s)	1.17	7.52
1.73				
Max Chl Dpth (ft)	6.86	Hydr. Depth (ft)	1.80	6.22
2.81				
Conv. Total (cfs)	284959.4	Conv. (cfs)	49563.2	55364.9
180031.4				
Length Wtd. (ft)	796.34	Wetted Per. (ft)	1250.75	64.66
1971.56				

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Min Ch El (ft) 0.50	112.40	Shear (lb/sq ft)	0.32	1.07
Alpha 0.00	3.81	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft) 25189.04	1.62	Cum Volume (acre-ft)	17946.12	10269.25
C & E Loss (ft) 3556.43	0.05	Cum SA (acres)	2843.47	702.57

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	121.07	Element	Left OB	Channel
Vel Head (ft) 0.100	0.13	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 848.74	120.93	Reach Len. (ft)	640.52	833.38
Crit W.S. (ft) 9607.51	118.59	Flow Area (sq ft)	4760.85	515.99
E.G. Slope (ft/ft) 10041.32	0.001662	Area (sq ft)	4760.85	515.99
Q Total (cfs) 16064.11	26361.00	Flow (cfs)	6730.64	3566.25
Top Width (ft) 2414.94	3812.47	Top Width (ft)	1334.53	63.00
Vel Total (ft/s) 1.67	1.77	Avg. Vel. (ft/s)	1.41	6.91
Max Chl Dpth (ft) 4.59	8.83	Hydr. Depth (ft)	3.57	8.19
Conv. Total (cfs) 394067.2	646659.3	Conv. (cfs)	165108.7	87483.4
Length Wtd. (ft) 2094.91	785.60	Wetted Per. (ft)	1335.21	64.66
Min Ch El (ft) 0.48	112.40	Shear (lb/sq ft)	0.37	0.83
Alpha 0.00	2.77	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	23262.33	11440.00

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32197.55  
 C & E Loss (ft) 0.03 Cum SA (acres) 3153.88 702.27  
 3844.20

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.74	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	124.68	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	119.34	Flow Area (sq ft)	10251.30	751.90
17441.39				
E.G. Slope (ft/ft)	0.000562	Area (sq ft)	10251.30	751.90
20377.96				
Q Total (cfs)	41717.00	Flow (cfs)	12595.08	3884.38
25237.54				
Top Width (ft)	4684.81	Top Width (ft)	1573.02	63.00
3048.79				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	1.23	5.17
1.45				
Max Chl Dpth (ft)	12.58	Hydr. Depth (ft)	6.52	11.93
8.34				
Conv. Total (cfs)	1759759.0	Conv. (cfs)	531301.4	163855.9
1064602.0				
Length Wtd. (ft)	780.73	Wetted Per. (ft)	1573.73	64.66
2094.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.23	0.41
0.29				
Alpha	1.96	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	33845.98	13588.08
45627.87				
C & E Loss (ft)	0.01	Cum SA (acres)	3544.27	704.06
4408.34				

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Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 191681.5

INPUT

Description: CF - old section 111 (Laurel study)

Station Elevation Data		num= 175							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	137	38	136	66	134	94	132	222	130
316	128	388	126	513	124	593	122	615	120
631	116	639.6	114.52	649.59	113.86	664.58	114.28	694.56	114.09
709.56	114.44	729.54	114.14	779.51	114.07	794.5	114.49	809.49	114.05
824.48	114.69	854.47	114.64	869.46	114.09	909.43	113.69	934.42	114.32
954.4	113.69	1009.37	114.18	1019.36	113.56	1044.35	114.12	1064.33	113.71
1089.32	114.32	1114.3	114.52	1139.29	113.75	1174.26	113.53	1199.25	114.37
1224.23	114.26	1239.22	113.66	1284.19	114.03	1299.18	114.88	1314.18	114.99
1339.16	114.13	1349.15	114.64	1369.14	114.48	1379.13	113.96	1429.1	113.99
1444.09	114.89	1454.09	114.24	1469.08	114.06	1489.06	114.43	1509.05	114
1544.03	114.09	1584	113.99	1603.99	114.57	1623.98	114.01	1638.97	114.78
1648.96	114.46	1673.95	114.92	1693.93	114.46	1703.93	114.57	1723.92	115.76
1753.9	114.88	1768.89	114.99	1778.88	115.65	1803.86	115.37	1843	115.91
1847	112.33	1864	112.63	1882	113.94	1884	115.95	1888.81	115.86
1903.8	116.14	1918.79	114.96	1933.78	115.22	1943.78	115.89	1968.76	115.01
1978.75	115.03	2003.73	114.32	2033.71	114.1	2053.69	115.39	2068.68	115.07
2088.66	114.08	2148.61	114.11	2168.59	114.52	2178.59	114.08	2198.57	114.24
2208.56	115.06	2228.54	114.11	2258.52	114.5	2298.49	114.41	2308.48	114.78
2338.45	114.52	2348.45	114.8	2363.43	113.93	2513.31	113.86	2533.29	114.08
2543.28	113.65	2578.25	113.7	2613.23	113.41	2623.22	113.11	2643.2	113.54
2658.19	113.07	2683.17	113.36	2693.16	113.09	2733.13	113.26	2793.08	113.1
2818.05	113.59	2833.04	113.19	2858.02	113.36	2878.01	113.89	2892.99	113.32
2932.96	113.8	2942.95	113.35	2962.93	113.3	2972.93	113.77	2987.91	113.5
3007.9	113.9	3027.88	113.27	3042.87	113.86	3052.86	113.19	3062.85	113.85
3072.84	113.5	3087.83	114.66	3107.81	112.97	3122.8	113.55	3142.79	113.42
3157.77	114.27	3172.76	112.6	3182.75	112.63	3187.75	110.55	3192.74	106.57
3197.74	111.22	3202.74	113.79	3217.72	112.89	3247.7	114.12	3267.68	112.95
3287.66	113.27	3307.65	112.78	3342.62	113.36	3352.61	112.81	3372.59	112.4
3382.59	113.04	3397.57	112.63	3402.57	111.7	3417.56	111.84	3432.54	112.89
3452.53	111.68	3462.52	112.14	3492.49	112.64	3517.47	112.33	3537.46	112.96
3567.43	112.28	3607.4	113.32	3622.39	114.16	3642.37	114.34	3657.36	115.2
3692.33	115.02	3779	116	3870	118	3921	120	3958	122
3991	124	4056	126	4089	128	4106	130	4124	132

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4139	134	4154	136	4167	138	4180	140	4193	142
4207	144	4215	146	4220	148	4225	150	4243	151

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1843 .03 1884 .1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1843	1884		801.4 802.52	801.75	.1	.3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	116.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	116.08	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	2137.27	121.79
4395.76				
E.G. Slope (ft/ft)	0.002637	Area (sq ft)	2137.27	121.79
4395.76				
Q Total (cfs)	8893.00	Flow (cfs)	2379.06	617.68
5896.26				
Top Width (ft)	3148.48	Top Width (ft)	1212.34	41.00
1895.14				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	1.11	5.07
1.34				
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)	1.76	2.97
2.32				
Conv. Total (cfs)	173189.3	Conv. (cfs)	46331.7	12029.2
114828.3				
Length Wtd. (ft)	801.69	Wetted Per. (ft)	1212.90	43.25
1900.50				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.29	0.46
0.38				
Alpha	1.85	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	9903.71	7751.88
14768.74				
C & E Loss (ft)	0.01	Cum SA (acres)	2311.95	691.74
3057.80				

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	117.50	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	117.45	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	3797.18	177.80
7032.12				
E.G. Slope (ft/ft)	0.001535	Area (sq ft)	3797.18	177.80
7032.12				
Q Total (cfs)	15174.00	Flow (cfs)	4715.78	885.34
9572.88				
Top Width (ft)	3219.79	Top Width (ft)	1217.80	41.00
1960.99				
Vel Total (ft/s)	1.38	Avg. Vel. (ft/s)	1.24	4.98
1.36				
Max Chl Dpth (ft)	10.88	Hydr. Depth (ft)	3.12	4.34
3.59				
Conv. Total (cfs)	387335.1	Conv. (cfs)	120376.1	22599.3
244359.7				
Length Wtd. (ft)	801.68	Wetted Per. (ft)	1218.53	43.25
1966.36				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.30	0.39
0.34				
Alpha	1.63	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	17901.64	10263.80
25066.21				
C & E Loss (ft)	0.01	Cum SA (acres)	2825.33	701.58
3517.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	120.26	Element	Left OB	Channel
Right OB				

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Vel Head (ft) 0.100	0.04	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	120.22	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 12580.66		Flow Area (sq ft)	7180.89	291.20
E.G. Slope (ft/ft) 12580.66	0.000662	Area (sq ft)	7180.89	291.20
Q Total (cfs) 16142.55	26361.00	Flow (cfs)	8895.16	1323.29
Top Width (ft) 2041.00	3312.38	Top Width (ft)	1230.38	41.00
Vel Total (ft/s) 1.28	1.31	Avg. Vel. (ft/s)	1.24	4.54
Max Chl Dpth (ft) 6.16	13.65	Hydr. Depth (ft)	5.84	7.10
Conv. Total (cfs) 627341.3	1024457.0	Conv. (cfs)	345689.0	51426.4
Length Wtd. (ft) 2046.42	801.67	Wetted Per. (ft)	1231.43	43.25
Min Ch El (ft) 0.25	112.33	Shear (lb/sq ft)	0.24	0.28
Alpha 0.00	1.48	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 31977.16	0.30	Cum Volume (acre-ft)	23174.54	11432.28
C & E Loss (ft) 3800.79	0.01	Cum SA (acres)	3135.03	701.27

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.42	Element	Left OB	Channel
Vel Head (ft) 0.100	0.03	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	124.38	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 21240.01		Flow Area (sq ft)	12486.36	462.02
E.G. Slope (ft/ft) 21240.01	0.000304	Area (sq ft)	12486.36	462.02



PatuxentRiver.rep				
Q Total (cfs)	41717.00	Flow (cfs)	14228.39	1936.57
25552.04				
Top Width (ft)	3514.33	Top Width (ft)	1353.90	41.00
2119.43				
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	1.14	4.19
1.20				
Max Chl Dpth (ft)	17.81	Hydr. Depth (ft)	9.22	11.27
10.02				
Conv. Total (cfs)	2390961.0	Conv. (cfs)	815483.5	110992.1
1464485.0				
Length Wtd. (ft)	801.66	Wetted Per. (ft)	1355.06	43.25
2124.97				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.18	0.20
0.19				
Alpha	1.44	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	33678.81	13576.46
45222.42				
C & E Loss (ft)	0.01	Cum SA (acres)	3522.75	703.06
4357.99				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190879.0

#### INPUT

Description: old section 110.1 (Laruel study)

Station Elevation Data num= 182

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	136	44	134	80	132	118	130	138	128
162	126	202	124	281	122	418	120	519.98	117.84
554.98	117.41	564.98	116.68	579.98	116.76	594.98	115.85	604.98	115.94
624.97	114.71	639.97	114.85	649.97	114.33	669.97	114.15	689.97	113.05
694.97	113.7	719.97	112.5	734.97	112.93	749.97	112.23	779.97	112.45
789.97	111.93	804.97	112.2	824.97	111.92	849.97	112.2	859.97	111.94
989.96	111.86	1014.96	112.55	1044.96	111.97	1064.96	112.45	1079.96	111.86
1134.95	111.88	1149.95	112.19	1169.95	113.21	1189.95	112.49	1219.95	112.97
1259.95	111.95	1279.95	112.79	1294.95	111.92	1354.94	111.94	1384.94	112.49
1399.94	111.95	1434.94	112.31	1454.94	111.97	1474.94	113.49	1494.94	112.28
1509.94	112.42	1524.94	111.99	1554.93	113.17	1589.93	112.63	1644.93	112.66

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1659.93	113.1	1684.93	112.48	1769.92	113.16	1799.92	112.08	1814.92	112.44
1824.92	113.91	1834.92	114.27	1866.04	114.19	1867.4	113.64	1867.465	110.96
1872.5	108.76	1878.39	110.86	1878.675	113.83	1904.515	114.24	1914.92	112.81
1939.92	114.24	1959.91	112.66	1979.91	113.44	2004.91	112.68	2014.91	113.01
2029.91	112.64	2074.89	112.93	2089.88	112.53	2104.87	113.06	2139.84	112.63
2164.82	113.06	2239.77	112.47	2259.75	111.91	2289.73	111.93	2324.7	112.4
2339.69	113.19	2364.67	112.94	2379.66	112.26	2459.59	112.26	2479.58	112.79
2499.56	112.48	2524.54	112.72	2569.51	112.02	2599.48	112.13	2604.48	112.54
2654.44	111.84	2714.39	112.02	2754.36	111.88	2774.35	112.46	2784.34	112.04
2814.32	112.1	2839.3	112.47	2884.26	112.37	2909.24	111.67	2924.23	113.25
2944.21	111.39	2959.2	113.67	2964.2	113.7	2984.18	109.53	2999.17	111.14
3014.16	111.51	3029.15	111.2	3039.14	108.52	3044.14	105.82	3054.13	110.29
3064.12	111.42	3069.12	110.55	3084.1	112.72	3104.09	112.47	3124.07	112.76
3149.05	110.95	3169.04	111.83	3189.02	110.94	3194.02	111.59	3204.01	110.95
3214	111.77	3228.99	111.34	3243.98	112.68	3258.97	112.11	3278.95	112.29
3303.93	111.91	3313.93	112.29	3333.91	111.83	3348.9	112.16	3363.89	111.54
3378.87	112.73	3388.87	112.2	3423.84	111.85	3438.83	112.64	3458.81	111.65
3478.8	112.47	3498.78	114.12	3548.74	111.33	3558.73	111.56	3593.71	111.21
3643.67	111.33	3668.65	112.08	3683.64	110.97	3723.6	110.92	3748.59	111.21
3758.58	110.93	3788.55	111.18	3833.52	111.25	3848.51	111.72	3863.5	111.31
3898.47	111.19	3913.46	111.59	3938.44	111	3978.41	111.34	4023.37	110.96
4123.29	111	4138.28	111.3	4163.26	111.09	4203.23	111.69	4238.2	112.97
4258.19	113.37	4273.18	112.24	4298.16	111.42	4313.14	111.39	4328.13	112.17
4348.12	114.49	4378.09	116.23	4413	118.76	4432.7	120.69	4462.26	122.54
4501.68	126.11	4526.31	129.48	4570.65	132.16	4605.14	133.05	4649.48	136.44
4708.6	140.35	4723.38	140.77						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1867.4 .031904.515 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1867.41904.515 697.31 727.92 802.22 .1 .3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	115.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	115.21	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	3318.91	89.96
7874.60				
E.G. Slope (ft/ft)	0.000624	Area (sq ft)	3318.91	89.96
7874.60				
Q Total (cfs)	8893.00	Flow (cfs)	2361.45	181.41

PatuxentRiver.rep

6350.13				
Top Width (ft)	3743.54	Top Width (ft)	1250.49	37.11
2455.94				
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)	0.71	2.02
0.81				
Max Chl Dpth (ft)	9.39	Hydr. Depth (ft)	2.65	2.42
3.21				
Conv. Total (cfs)	355879.5	Conv. (cfs)	94500.5	7259.8
254119.2				
Length Wtd. (ft)	779.48	Wetted Per. (ft)	1251.21	43.26
2460.41				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.10	0.08
0.12				
Alpha	1.10	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	9853.52	7749.93
14655.82				
C & E Loss (ft)	0.00	Cum SA (acres)	2289.30	691.02
3017.76				

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	116.91	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	116.90	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	5468.69	152.65
12046.76				
E.G. Slope (ft/ft)	0.000419	Area (sq ft)	5468.69	152.65
12046.76				
Q Total (cfs)	15174.00	Flow (cfs)	4322.45	358.87
10492.68				
Top Width (ft)	3825.23	Top Width (ft)	1305.37	37.11
2482.75				
Vel Total (ft/s)	0.86	Avg. Vel. (ft/s)	0.79	2.35
0.87				
Max Chl Dpth (ft)	11.08	Hydr. Depth (ft)	4.19	4.11
4.85				
Conv. Total (cfs)	741042.0	Conv. (cfs)	211092.6	17525.8
512423.5				
Length Wtd. (ft)	776.38	Wetted Per. (ft)	1306.15	43.26
2487.28				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.11	0.09

PatuxentRiver.rep

0.13 Alpha	1.13	Stream Power (lb/ft s)	4723.38	0.00
0.00 Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	17816.40	10260.76
24890.63 C & E Loss (ft)	0.00	Cum SA (acres)	2802.12	700.86
3476.10				

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	119.95	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	119.93	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	9638.57	265.42
19651.20				
E.G. Slope (ft/ft)	0.000241	Area (sq ft)	9638.57	265.42
19651.20				
Q Total (cfs)	26361.00	Flow (cfs)	7872.25	684.12
17804.63				
Top Width (ft)	4003.83	Top Width (ft)	1446.25	37.11
2520.46				
Vel Total (ft/s)	0.89	Avg. Vel. (ft/s)	0.82	2.58
0.91				
Max Chl Dpth (ft)	14.11	Hydr. Depth (ft)	6.66	7.15
7.80				
Conv. Total (cfs)	1697795.0	Conv. (cfs)	507016.9	44061.3
1146717.0				
Length Wtd. (ft)	773.95	Wetted Per. (ft)	1447.07	43.26
2525.11				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.10	0.09
0.12				
Alpha	1.16	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	23019.82	11427.15
31680.54				
C & E Loss (ft)	0.00	Cum SA (acres)	3110.41	700.55
3758.81				

CROSS SECTION OUTPUT Profile #500yr

PatuxentRiver.rep

E.G. Elev (ft) Right OB	124.25	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	124.24	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 30628.53		Flow Area (sq ft)	16422.08	425.24
E.G. Slope (ft/ft) 30628.53	0.000135	Area (sq ft)	16422.08	425.24
Q Total (cfs) 27559.78	41717.00	Flow (cfs)	13032.10	1125.12
Top Width (ft) 2576.51	4283.81	Top Width (ft)	1670.19	37.11
Vel Total (ft/s) 0.90	0.88	Avg. Vel. (ft/s)	0.79	2.65
Max Chl Dpth (ft) 11.89	18.42	Hydr. Depth (ft)	9.83	11.46
Conv. Total (cfs) 2367605.0	3583823.0	Conv. (cfs)	1119561.0	96657.0
Length Wtd. (ft) 2581.34	772.15	Wetted Per. (ft)	1671.06	43.26
Min Ch El (ft) 0.10	108.76	Shear (lb/sq ft)	0.08	0.08
Alpha 0.00	1.19	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 44745.08	0.10	Cum Volume (acre-ft)	33412.89	13568.29
C & E Loss (ft) 4314.77	0.00	Cum SA (acres)	3494.94	702.34

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190151.1

INPUT

Description: old section 110 (Laurel study)

Station Elevation Data

num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.02	10	137.21	59.99	135.81	79.99	134.8	139.99	133.2
154.99	133.33	179.98	132.05	224.98	131.03	234.98	131.87	254.98	132.03
264.98	131.07	274.98	128.58	289.97	122.91	304.97	118.05	314.97	115.58
334.97	112.42	339.97	112.01	359.97	112.24	379.97	112.06	394.96	113.42

## **Hec-Ras Input and Output Data Files**

**(Proposed)**

# PROPOSED INPUT & OUTPUT DATA

PatuxentRiver.rep

HEC-RAS Version 4.1.0 Jan 2010  
U.S. Army Corps of Engineers  
Hydrologic Engineering Center  
609 Second Street  
Davis, California

```
X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X  X      X  X      X
X      X  X       X       X  X      X  X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X       X  X      X  X      X      X
X      X  X       X   X      X  X      X  X      X
X      X  XXXXXX   XXXX     X  X      X  X      XXXXX
```

## PROJECT DATA

Project Title: Patuxent River  
Project File : PatuxentRiver.prj  
Run Date and Time: 6/5/2019 2:45:47 PM

Project in English units

## Project Description:

Patuxent River - Anne Arundel County (Including the Laurel model) - Detailed Method

Vertical Datum: North American Vertical Datum 88 (NAVD88)

Projection: NAD 1983 State Plane Maryland FIPS 1900 Feet

Geographic Coordinate System: North American 1983 Datum: North American 1983

Created by: Prince Georges County, MD in cooperation with USACE - Buffalo District as part of FEMA Map Modernization study for Anne Arundel County

GeoRAS Version: 4.2.92

ArcGIS Version: 9.2

## Reach Boundary

Conditions: Known WS Elevations from the 1985 FIS Report for Anne Arundel County.

PatuxentRiver.rep

\*\*\* This tributary was formerly known as Little Patuxent River Trib 2. The channel has been relocated to Dorsey Run. New ground data was provided for this model in CAD format. \*\*\*

PLAN DATA

Plan Title: Plan 04

Plan File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Proposed Hec-Ras Model\PatuxentRiver.p04

Geometry Title: Patuxent River

Geometry File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Proposed Hec-Ras Model\PatuxentRiver.g01

Flow Title : 1985 FIS Flows

Flow File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Proposed Hec-Ras Model\PatuxentRiver.f01

Plan Summary Information:

Number of:	Cross Sections = 226	Multiple Openings = 1
	Culverts = 0	Inline Structures = 0
	Bridges = 15	Lateral Structures = 0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance	= False
Left Offset	= 0
Right Offset	= 0

River = Patuxent River Reach = 1



PatuxentRiver.rep

RS	Profile	Method	Value1	Value2
216363.550yr		1	196	294
216301.950yr		1	209	278
216016.050yr		1	245	298.5
215931.350yr		1	630	745
214800.650yr		1	860	970
213718.650yr		1	717	835
213006.750yr		1	223	378
211665.050yr		1	226	400
210690.250yr		1	330	610
209714.250yr		1	390	570
209629.950yr		1	800	940
209499.850yr		1	850	980
209431.550yr		1	1140	1350
208205.550yr		1	310	620
206854.750yr		1	320	670
205796.750yr		1	640	1110
205710.050yr		1	700	1200
205609.150yr		1	810	1340
205486.350yr		1	980	1560
205349.250yr		1	1000	1800
205182.950yr		1	1070	2000
204928.050yr		1	1570	2540
204628.050yr		1	1920	2550
204574.450yr		1	2090.1	2508
204456.750yr		1	2490.1	2907
204399.650yr		1	1768	2190
203946.750yr		1	2510	3570
203357.750yr		1	2500	3850
202488.850yr		1	2210	3670
202169.450yr		1	2340	3820
201484.950yr		1	2920	4300
201411.650yr		1	3000	3840
201119.50yr		1	3050	3580
201058.750yr		1	2240	2843
200115.450yr		1	1300	2406
198588.050yr		1	750	2750
197599.650yr		1	993	4223
196568.850yr		1	300	3450
196356.850yr		1	475	3550
195583.150yr		1	400	3300
193854.450yr		1	600	2375
192514.950yr		1	880	3500
191681.550yr		1	890	3460
190879.050yr		1	800	3540
190151.150yr		1	620	3400
189009.250yr		1	780	3430
188388.250yr		1	1020	3550

PatuxentRiver.rep

187454.750yr	1	350	2190
186994.150yr	1	2120	3850
186902.050yr	1	2090	3870
186829.250yr	1	2085	3850
186756.850yr	1	1850	3610
186101.50yr	1	1870	3550
185454.750yr	1	1830	3370
183710.550yr	1	1780	2570
183635.850yr	1	1773	2145
183459.550yr	1	1728	2100
183401.850yr	1	1600	2012
182254.050yr	1	1570	3050
181670.150yr	1	1320	3180
180215.650yr	1	910	3030
179205.650yr	1	810	2750
178886.250yr	1	850	2780
177708.150yr	1	1050	3200
176090.050yr	1	570	2420
175001.150yr	1	600	2380
173461.950yr	1	600	2560
172645.350yr	1	1420	3430
171490.750yr	1	1222	3000
170202.150yr	1	1620	3600
168859.950yr	1	1690	3750
167314.950yr	1	620	2610
166384.650yr	1	950	2910
165339.050yr	1	910	2710
164309.750yr	1	1440	3060
163946.350yr	1	1110	2710
163384.450yr	1	1860	3550
163295.250yr	1	1875	3450
163210.750yr	1	1310	2870
162451.950yr	1	2610	4140
161033.550yr	1	2815	4200
159935.550yr	1	1800	2820
159495.450yr	1	1350	2480
158176.350yr	1	1200	2660
156362.650yr	1	980	2880
155014.350yr	1	1835	3080
153499.950yr	1	1050	3130
151588.450yr	1	1340	3315
149785.650yr	1	1230	3100
148278.950yr	1	1350	3050
147072.650yr	1	2089	2430
146789.850yr	1	2014	2355
145823.350yr	1	1985	3275
143628.350yr	1	2100	2650
141960.550yr	1	2035	2535

PatuxentRiver.rep

141653.250yr	1	1005	1490
141112.750yr	1	1500	2540
140725.050yr	1	780	2680
140356.050yr	1	700	2700
138600.750yr	1	2590	3980
137262.750yr	1	2060	3160
136140.350yr	1	2162	2942
136060.650yr	1	1124	1346
135994.250yr	1	915	1175
134652.250yr	1	1210	3040
133564.350yr	1	660	2235
132261.750yr	1	1230	2665
131156.50yr	1	1020	2330
129757.850yr	1	1350	2630
128936.550yr	1	1490	2660
127390.950yr	1	2210	3740
125172.750yr	1	1670	3260
123616.050yr	1	1050	2630
122117.850yr	1	800	2760
120798.450yr	1	1350	2970
119847.350yr	1	1060	2600
119643.350yr	1	910	2430
118899.150yr	1	1370	3240
118598.450yr	1	1838	3750
118382.450yr	1	1620	3550
117158.650yr	1	1370	3380
115118.650yr	1	1340	4300
113857.750yr	1	1935	3980
112311.150yr	1	2105	4200
111857.050yr	1	1290	3246
110321.250yr	1	320	2040
108661.550yr	1	950	2460
107428.850yr	1	1310	2550
106061.750yr	1	950	1900
104629.950yr	1	1760	2980
103356.550yr	1	700	1440
102790.750yr	1	1870	2282
102355.950yr	1	1850	2260
101726.550yr	1	900	1450
101166.350yr	1	1080	1630
101008.150yr	1	1115	1680
100958.850yr	1	1110	1670
100623.850yr	1	1300	1870
100397.750yr	1	2430	3030
100186.050yr	1	2080	2730
99470.2550yr	1	1710	2390
99238.1150yr	1	1660	2352
98903.5150yr	1	1570	2324

PatuxentRiver.rep

97274.1450yr	1	740	1640
96386.7250yr	1	1440	2490
95236.4250yr	1	1240	2638
93761.3950yr	1	1090	2438
92395.8550yr	1	1265	2570
90716.4150yr	1	1220	2990
89845.1450yr	1	565	2270
86341.9750yr	1	2650	3505
85794.8850yr	1	2350	3070
84890.1550yr	1	3870	4640
82338.9050yr	1	1720	2880
81075.2550yr	1	890	2260
79897.2850yr	1	990	2210
79406.1850yr	1	1110	2180
79085.9850yr	1	910	2003
78360.9750yr	1	540	1580
77551.6850yr	1	1173	2060
76567.9450yr	1	1170	2070
76388.7750yr	1	1100	2025
74621.2150yr	1	1710	3130
73877.7350yr	1	1581	3170
73089.8150yr	1	2280	3920
71461.0350yr	1	2150	3530
69955.3650yr	1	360	1654
69848.6950yr	1	410	1710
69009.3350yr	1	240	1480
68580.7250yr	1	1960	3135
67965.0450yr	1	2470	3285
66861.6750yr	1	2030	2830
64793.3750yr	1	1630	2290
64024.2650yr	1	2870	3520
63352.6550yr	1	2435	3105
62871.7550yr	1	2650	3330
61944.7950yr	1	2750	3458
61589.4350yr	1	2360	3095
60994.1350yr	1	2980	3690
59680.2150yr	1	2070	2806
59049.4350yr	1	1950	2700
58531.2450yr	1	2410	3170
57492.1050yr	1	2733	3470
56694.4550yr	1	2220	2920
55799.4250yr	1	2570	3620
53970.5 50yr	1	1320	2490
53164.6250yr	1	1400	2550
51972.2650yr	1	1910	3070
51040.8650yr	1	1995	3070
49806.0650yr	1	1900	2950
48318.4650yr	1	2316	3330

PatuxentRiver.rep

47415.1950yr	1	2375	3380
47012.3450yr	1	2550	3530
45507.4750yr	1	1960	3130
44258.6050yr	1	2080	3350
43180.3350yr	1	1270	2740
42465.8350yr	1	1140	2820
41827.2250yr	1	760	2620
41146.1050yr	1	850	2930
39893.4650yr	1	2250	4790
39135.5050yr	1	2190	5000
38741.5750yr	1	2260	5230
38383.1250yr	1	2340	5470
37817.1550yr	1	2390	5660
37178.9750yr	1	1490	4720
36268.6450yr	1	2260	5240
35482.7250yr	1	2350	4970
32805.5950yr	1	1575	2990
31627.2550yr	1	860	2012
31529.3850yr	1	1750	2432
31231.0150yr	1	1727	2429
31141.1950yr	1	1680	2391
31018.2350yr	1	1430	2140
29818.9550yr	1	1702	2242
28999.9850yr	1	1409	1949
27340.6950yr	1	3367	4187
26469.4650yr	1	2124	2944
26064.8850yr	1	3792	4612
24728.6450yr	1	1997	2817
22889.8850yr	1	2421	3088
21021.2250yr	1	1503	2253

FLOW DATA

Flow Title: 1985 FIS Flows

Flow File : n:\MD-Prince Georges\Patuxent Green\data transfer\MDE\Out\2019-06-06  
Resubmission to MDE\Hec-Ras\Proposed Hec-Ras Model\PatuxentRiver.f01

Flow Data (cfs)

River	Reach	RS	10yr	50yr
100yr	500yr			
Patuxent River	1	216363.5	8277	15174
26258	41717			
Patuxent River	1	209431.5	8324	15174

PatuxentRiver.rep				
26267	41717			
Patuxent River	1	200115.4	8893	15174
26361	41717			
Patuxent River	1	177708.1	8893	17000
26361	45000			
Patuxent River	1	127390.9	19000	35000
45000	70000			
Patuxent River	1	66861.67	24500	43000
52500	77000			

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Patuxent River	1	10yr	
Normal S = 0.0014			
Patuxent River	1	50yr	
Normal S = 0.0014			
Patuxent River	1	100yr	
Normal S = 0.0014			
Patuxent River	1	500yr	
Normal S = 0.0014			

GEOMETRY DATA

Geometry Title: Patuxent River  
 Geometry File : n:\MD-Prince Georges\Patuxent Green\data  
 transfer\MDE\Out\2019-06-06 Resubmission to MDE\Hec-Ras\Proposed Hec-Ras  
 Model\PatuxentRiver.g01

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 216363.5

INPUT

Description: old section 133.6 (Laurel study) - limit of detailed study  
 Station Elevation Data num= 137

PatuxentRiver.rep

RIVER: Patuxent River

REACH: 1

RS: 201119

INPUT

Description: CH - D/S Bridge #14 - old section 119.2 (Laurel study)

Station Elevation Data num= 163

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	156.23	24.93	157.24	59.82	156.77	144.57	156.95	174.48	155.91
229.32	155.56	259.23	148.84	284.16	145.36	309.08	145.6	343.98	144.01
418.76	143.38	433.72	141.72	453.66	143.79	498.52	143.39	543.39	140.37
563.33	140.14	588.26	141.46	608.2	140.11	628.14	142.01	643.09	145.48
653.07	146.23	668.02	142.62	682.98	145.58	692.95	146.42	702.92	144.84
712.89	146.04	722.86	143.35	732.83	142.98	752.77	139.09	767.77	145.39
832.76	145.07	882.76	143.37	902.76	143.41	962.75	141.75	977.75	142.34
1047.75	141.76	1082.75	140.7	1122.74	140.55	1152.74	139.23	1177.74	138.72
1237.73	139.34	1272.73	138.32	1312.73	138.41	1332.73	137.4	1347.73	138.4
1367.72	138.27	1382.72	136.93	1397.72	137.45	1432.72	135.8	1452.72	136.91
1492.72	133.44	1512.71	135.31	1527.71	135.06	1542.71	132.62	1587.71	129.61
1607.71	127.86	1702.7	127.91	1717.7	130.49	1732.7	130.14	1752.7	130.85
1772.7	130.19	1822.69	129.91	1852.69	129.01	1882.69	129.11	1927.68	128.56
1942.68	129.03	1977.68	128.62	1987.68	129.51	1997.68	128.24	2037.68	128.09
2062.67	128.68	2077.67	128.38	3067.62	130.11	3105	130.1	3203	129.8
3205	129.8	3323	129.6	3325	129.6	3341	129.03	3354	123.76
3371	121.95	3391	124.21	3392	127.3	3462	129.58	3465	129.21
3582	129.61	3584	129.64	3702	129.64	3704	129.42	3802	129.75
3802.59	130.61	3842.59	131.04	3857.59	132.53	3882.59	140.16	3892.58	141.71
3922.58	141.77	3932.58	139.66	3952.58	131.89	3962.58	130.58	3997.58	128.99
4042.58	129.76	4057.58	131.17	4077.58	135.76	4092.57	136.73	4107.57	136.07
4147.57	137.73	4202.56	136.72	4212.56	137.39	4237.54	137.17	4267.42	135.98
4282.36	136.64	4302.28	136.18	4352.08	137.27	4367.02	136.9	4416.82	139.3
4441.72	139.19	4456.66	139.8	4501.48	138.97	4541.32	140.12	4581.16	139.35
4601.08	136.43	4611.04	137.04	4625.98	139.98	4650.88	140.99	4660.84	140.2
4670.8	137.76	4680.76	139.46	4690.72	138.58	4705.66	140.89	4720.6	139.43
4745.5	138.94	4770.4	141.08	4795.3	138.08	4805.26	140.48	4815.22	140.77
4825.18	139.13	4840.12	141.98	4865.02	142.4	4879.96	140.97	4894.9	137.13
4904.86	136.17	4929.76	139.09	4939.72	139.23	4964.62	136.82	4984.54	141.6
5004.46	140.74	5009.44	139.67	5024.38	141.71	5044.3	142.56	5123.98	143.1
5183.74	141.02	5203.66	141.11	5218.6	140.26	5243.5	140.09	5268.4	141.17
5343.1	141.48	5363.02	142.09	5387.92	141.68	5407.84	142.98	5427.76	142.39
5467.6	145.2	5496.25	145.22	5543.6	144.26				

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	3325	.03	3462	.1

Bank Sta: Left 3325 Right 3462 Lengths: Left Channel 55.2 Right 60.26 138.48 Coeff Contr. .3 Expan. .5

Ineffective Flow num= 2

PatuxentRiver.rep

Sta L	Sta R	Elev	Permanent
0	3055	134.3	F
3565	5543.6	134.3	T
Blocked Obstructions			num= 1
Sta L	Sta R	Elev	
3935.67	4090.2	136.51	

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	133.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.53	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	131.64	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	131.64	Flow Area (sq ft)	478.21	655.35
232.29				
E.G. Slope (ft/ft)	0.006059	Area (sq ft)	4182.05	655.35
747.25				
Q Total (cfs)	8324.00	Flow (cfs)	809.71	7052.29
462.00				
Top Width (ft)	2291.19	Top Width (ft)	1767.59	137.00
386.60				
Vel Total (ft/s)	6.09	Avg. Vel. (ft/s)	1.69	10.76
1.99				
Max Chl Dpth (ft)	9.69	Hydr. Depth (ft)	1.77	4.78
2.26				
Conv. Total (cfs)	106934.9	Conv. (cfs)	10402.0	90597.8
5935.1				
Length Wtd. (ft)	61.35	Wetted Per. (ft)	270.00	140.55
103.02				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.67	1.76
0.85				
Alpha	2.65	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	10154.08	7818.78
16149.15				
C & E Loss (ft)	0.29	Cum SA (acres)	2423.91	703.41
3491.27				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.



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Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	135.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.16	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	133.20	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	133.20	Flow Area (sq ft)	900.48	869.62
393.38				
E.G. Slope (ft/ft)	0.006424	Area (sq ft)	916.07	869.62
447.73				
Q Total (cfs)	15174.00	Flow (cfs)	2393.99	11635.46
1144.56				
Top Width (ft)	530.00	Top Width (ft)	275.00	137.00
118.00				
Vel Total (ft/s)	7.01	Avg. Vel. (ft/s)	2.66	13.38
2.91				
Max Chl Dpth (ft)	11.25	Hydr. Depth (ft)	3.34	6.35
3.82				
Conv. Total (cfs)	189317.5	Conv. (cfs)	29868.4	145169.1
14280.0				
Length Wtd. (ft)	61.81	Wetted Per. (ft)	270.00	140.55
103.02				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	1.34	2.48
1.53				
Alpha	2.83	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	13214.15	10656.56
21609.21				
C & E Loss (ft)	0.36	Cum SA (acres)	1662.90	712.68
2582.79				

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may

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indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	134.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.39	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	134.30	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.30	Flow Area (sq ft)	8938.68	1020.24
506.63				
E.G. Slope (ft/ft)	0.002014	Area (sq ft)	8938.68	1020.24
1801.98				
Q Total (cfs)	26267.00	Flow (cfs)	17370.37	8502.58
394.05				
Top Width (ft)	2350.12	Top Width (ft)	1811.73	137.00
401.39				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.94	8.33
0.78				
Max Chl Dpth (ft)	12.35	Hydr. Depth (ft)	4.93	7.45
1.26				
Conv. Total (cfs)	585270.5	Conv. (cfs)	387039.3	189451.0
8780.1				
Length Wtd. (ft)	57.42	Wetted Per. (ft)	1812.52	140.55
402.22				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.62	0.91
0.16				
Alpha	3.97	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	23849.13	11531.38
34575.48				
C & E Loss (ft)	0.10	Cum SA (acres)	3296.94	713.14
4282.73				

Warning: The energy equation could not be balanced within the specified number of

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iterations. The program used critical depth for the water surface and continued on with the calculations.  
 Warning: Divided flow computed for this cross-section.  
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	136.09	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	135.52	Reach Len. (ft)	55.20	60.26
138.48				
Crit W.S. (ft)	134.31	Flow Area (sq ft)	11179.50	1187.77
999.91				
E.G. Slope (ft/ft)	0.002583	Area (sq ft)	11179.50	1187.77
2295.27				
Q Total (cfs)	41717.00	Flow (cfs)	27935.99	12404.86
1376.16				
Top Width (ft)	2398.69	Top Width (ft)	1856.29	137.00
405.40				
Vel Total (ft/s)	3.12	Avg. Vel. (ft/s)	2.50	10.44
1.38				
Max Chl Dpth (ft)	13.57	Hydr. Depth (ft)	6.02	8.67
2.47				
Conv. Total (cfs)	820857.9	Conv. (cfs)	549691.4	244088.1
27078.4				
Length Wtd. (ft)	59.01	Wetted Per. (ft)	1857.25	140.55
406.41				
Min Ch El (ft)	121.95	Shear (lb/sq ft)	0.97	1.36
0.40				
Alpha	3.77	Stream Power (lb/ft s)	5543.60	0.00
0.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	34747.75	13702.50
49012.29				
C & E Loss (ft)	0.15	Cum SA (acres)	3704.46	715.01
4988.30				

CROSS SECTION

PatuxentRiver.rep

RIVER: Patuxent River

REACH: 1

RS: 201058.7

INPUT

Description: old section 119.1 (Laurel study)

Station Elevation Data num= 171

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	147.89	59.96	146.91	94.93	147.39	129.91	146.92	169.88	145.98
189.87	145.16	204.86	142.09	209.85	143.47	224.84	145.23	244.83	144.25
279.8	144.51	294.79	144.02	309.78	144.64	344.76	142.98	364.75	142.39
379.74	143.17	409.71	141.75	419.71	142.21	434.7	141.49	449.69	142.04
469.67	140.4	489.66	140.84	499.65	140.2	514.64	141.63	589.59	138.54
609.58	139.31	634.56	139.17	649.55	138.38	669.53	138.97	689.52	138.03
699.51	138.77	719.5	138.93	739.48	138.28	769.46	138.29	779.46	137.4
809.44	137.67	859.4	136.94	864.4	137.43	879.39	135.24	904.37	133.95
939.35	132.95	989.31	132.17	1029.28	130.45	1054.27	128.56	1069.25	130.66
1089.24	130.52	1114.22	128.35	1129.21	127.86	1164.19	127.95	1199.16	130.15
1209.16	130.2	1254.12	131.94	1274.11	131.13	1354.05	129.64	1389.03	127.22
1399.02	128.19	1424	128.6	1438.99	127.71	1453.98	127.81	1468.97	126.94
1493.95	128.53	1513.94	127.34	1523.93	127.96	1543.92	126.4	1568.9	126.19
2423.3	127.19	2433.29	127.51	2498.24	127.54	2578.19	128.6	2618.16	128.43
2648.13	128.63	2663.12	129.2	2678.11	128.65	2698.1	128.74	2708.09	129.78
2723.08	129.53	2738.07	130.28	2748.06	129.55	2763.05	130.01	2773	129.46
2780	123.53	2805	122.96	2831	123.15	2833	127.89	2850.37	131.41
2864.99	134.79	2879.87	135.8	2914.6	136.47	2924.52	137.7	2934.44	136.97
2954.29	137.98	2964.21	137.5	2979.09	135.27	3003.89	140.21	3048.54	140.74
3058.46	140.58	3088.22	141.51	3103.11	141	3127.91	141.61	3137.83	141.13
3172.56	141.75	3192.4	141.25	3207.28	141.54	3237.04	140.41	3251.93	139.43
3271.77	139.11	3301.53	136.31	3321.38	135.3	3341.22	133.09	3366.02	131.26
3380.9	128.73	3390.83	128.18	3425.62	128.77	3445.56	127.41	3465.49	127.31
3495.4	128.43	3520.32	127.43	3535.27	128.91	3555.21	130.05	3575.15	130.45
3580	131.2	3581	149.2	3729	149.2	3730	136.2	3759.56	134.46
3774.51	135.31	3789.46	133.34	3804.42	136.42	3844.29	135.43	3864.22	135.93
3879.18	135.34	3904.1	135.36	3934	135.88	3953.94	137.31	3988.83	137.76
4013.75	134.93	4023.72	136	4038.67	134.01	4048.64	135.94	4068.57	132.04
4103.46	133.08	4143.33	131.37	4158.29	132.01	4178.22	131.52	4188.19	132.13
4233.04	131.94	4352.66	132.01	4407.48	133.85	4447.35	135.7	4467.29	134.46
4482.24	135.62	4532.08	136.12	4542.04	135.84	4561.98	137.51	4566.96	136.8
4576.93	137.91	4611.82	138.56	4626.77	139.45	4700	141.2	4701	149.2
4789	149.2	4790	141.2	4796.22	139.61	4811.17	138.48	4856.03	139.71
4889.42	140.1	4920.64	139.79	4956.02	141.14	4980.73	140.9	4990.61	139.96
5020.26	140.32								

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.1	2773	.035
		2833	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

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2773	2833	508.58	943.33	306.29	.1	.3
Ineffective Flow	num=	2				
Sta L	Sta R	Elev	Permanent			
0	2300	133.7	F			
2935	5020.26	133.7	T			

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	132.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.95	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	131.56	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	130.88	Flow Area (sq ft)	1616.86	476.47
33.20				
E.G. Slope (ft/ft)	0.004018	Area (sq ft)	6621.19	476.47
671.44				
Q Total (cfs)	8324.00	Flow (cfs)	3455.09	4822.53
46.38				
Top Width (ft)	2057.32	Top Width (ft)	1750.23	60.00
247.09				
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	2.14	10.12
1.40				
Max Chl Dpth (ft)	8.60	Hydr. Depth (ft)	3.42	7.94
1.84				
Conv. Total (cfs)	131315.4	Conv. (cfs)	54505.8	76077.9
731.7				
Length Wtd. (ft)	688.34	Wetted Per. (ft)	473.16	65.33
18.38				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	0.86	1.83
0.45				
Alpha	4.00	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	2.13	Cum Volume (acre-ft)	10147.24	7818.00
16146.89				
C & E Loss (ft)	0.22	Cum SA (acres)	2421.68	703.28
3490.27				

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	134.56	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.43	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	133.13	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	132.40	Flow Area (sq ft)	2362.25	571.02
42.31				
E.G. Slope (ft/ft)	0.005386	Area (sq ft)	2729.70	571.02
42.31				
Q Total (cfs)	15174.00	Flow (cfs)	7525.05	7549.73
99.22				
Top Width (ft)	603.00	Top Width (ft)	533.00	60.00
10.00				
Vel Total (ft/s)	5.10	Avg. Vel. (ft/s)	3.19	13.22
2.34				
Max Chl Dpth (ft)	10.17	Hydr. Depth (ft)	4.99	9.52
4.23				
Conv. Total (cfs)	206756.4	Conv. (cfs)	102534.2	102870.4
1351.9				
Length Wtd. (ft)	665.39	Wetted Per. (ft)	473.16	65.33
13.42				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	1.68	2.94
1.06				
Alpha	3.54	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	2.22	Cum Volume (acre-ft)	13211.84	10655.57
21608.43				
C & E Loss (ft)	0.35	Cum SA (acres)	1662.39	712.54
2582.59				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The cross section had to be extended vertically during the critical depth calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

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need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	134.36	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.16	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	133.70	Flow Area (sq ft)	11366.42	632.81
372.46				
E.G. Slope (ft/ft)	0.001452	Area (sq ft)	11366.42	632.81
2027.42				
Q Total (cfs)	26267.00	Flow (cfs)	21406.83	4652.16
208.01				
Top Width (ft)	2579.42	Top Width (ft)	1872.78	60.00
646.64				
Vel Total (ft/s)	2.12	Avg. Vel. (ft/s)	1.88	7.35
0.56				
Max Chl Dpth (ft)	11.20	Hydr. Depth (ft)	6.07	10.55
0.58				
Conv. Total (cfs)	689301.6	Conv. (cfs)	561760.5	122082.6
5458.5				
Length Wtd. (ft)	579.68	Wetted Per. (ft)	1873.81	65.33
651.22				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	0.55	0.88
0.05				
Alpha	2.77	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	1.07	Cum Volume (acre-ft)	23836.26	11530.23
34569.39				
C & E Loss (ft)	0.01	Cum SA (acres)	3294.61	713.01
4281.07				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

PatuxentRiver.rep				
		Element	Left OB	Channel
E.G. Elev (ft)	135.82			
Right OB				
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	135.54	Reach Len. (ft)	508.58	943.33
306.29				
Crit W.S. (ft)	133.70	Flow Area (sq ft)	13965.03	715.49
1367.12				
E.G. Slope (ft/ft)	0.001869	Area (sq ft)	13965.03	715.49
3030.80				
Q Total (cfs)	41717.00	Flow (cfs)	33950.98	6476.44
1289.57				
Top Width (ft)	2829.29	Top Width (ft)	1895.68	60.00
873.61				
Vel Total (ft/s)	2.60	Avg. Vel. (ft/s)	2.43	9.05
0.94				
Max Chl Dpth (ft)	12.58	Hydr. Depth (ft)	7.37	11.92
1.56				
Conv. Total (cfs)	964978.5	Conv. (cfs)	785338.6	149810.1
29829.7				
Length Wtd. (ft)	558.44	Wetted Per. (ft)	1896.76	65.33
880.52				
Min Ch El (ft)	122.96	Shear (lb/sq ft)	0.86	1.28
0.18				
Alpha	2.60	Stream Power (lb/ft s)	5020.26	0.00
0.00				
Frctn Loss (ft)	1.27	Cum Volume (acre-ft)	34731.81	13701.18
49003.82				
C & E Loss (ft)	0.01	Cum SA (acres)	3702.08	714.87
4986.27				

Warning: Divided flow computed for this cross-section.  
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River  
REACH: 1 RS: 200115.4

INPUT

Description: old section 118 (Laurel study)

Station Elevation Data num= 203

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
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PatuxentRiver.rep

0	148.03	24.97	148.06	39.96	147.25	89.9	147.57	139.85	146.64
169.82	146.95	194.79	148.02	239.74	146.73	274.71	145.45	304.67	144.82
339.64	145.33	349.63	144.86	359.62	143.06	374.6	143.85	399.57	144.05
444.52	142.92	484.48	143.44	534.43	143.04	549.41	142.38	589.37	142.63
624.33	142.11	639.32	142.7	669.28	142.19	709.24	139.52	754.19	137.8
769.18	136.89	809.13	132.81	864.07	129.41	894.04	129.03	914.02	128.04
929	127.91	958.97	125.98	983.94	125.62	1028.9	125.62	1053.87	129.28
1078.84	129.79	1093.83	130.75	1118.8	130.44	1128.79	130.9	1188.72	131.69
1233.68	131.03	1278.63	129.1	1323.58	128.37	1358.54	126.74	1393.5	126.87
1413.48	126.49	1438.46	125.28	1468.42	124.59	1503.39	124.88	1523.36	124.57
1558.33	125.22	1593.29	124.58	1608.27	125.18	1743.13	125.13	1788.08	125.61
1863	125.51	1887.97	126.04	1917.94	125.63	1972.88	126.12	2017.83	126.19
2062.78	126.62	2077.77	126.49	2107.74	127.04	2117.73	126.51	2132.71	127.2
2162.68	127.39	2187.65	128.21	2207.63	127.89	2237.6	128.72	2267.56	127.72
2282.55	128.56	2317.48	128.41	2327.44	128.9	2339	128.9	2344	122.06
2360	122.31	2374	122.74	2378	124.57	2389	124.85	2396	129.51
2407.17	129.18	2422.08	127.58	2451.92	128.1	2471.81	132.14	2496.67	132.6
2526.5	135.4	2541.42	137.62	2556.33	136.96	2586.17	137.57	2601.08	137.27
2630.91	138.24	2650.8	139.31	2680.64	139.59	2700.53	141.48	2710.47	141.71
2725.39	143.56	2755.22	142.03	2829.8	143.57	2864.61	143.31	2899.41	144.3
2969.02	145.01	3028.69	144.14	3043.6	144.68	3058.52	144	3098.3	143.62
3133.1	142.81	3172.94	140.39	3197.87	140.66	3207.85	140.24	3217.82	138.35
3237.77	131.58	3247.74	129.45	3267.69	127.62	3287.64	126.5	3312.57	126.52
3392.36	125.49	3407.32	125.8	3427.27	124.89	3447.21	126.37	3467.16	125.89
3497.08	125.99	3517.03	126.83	3571.89	126.39	3601.81	127.08	3616.77	126.75
3636.71	127.44	3681.59	127.33	3691.57	126.64	3711.52	127.81	3756.4	127.53
3826.21	125.95	3836.19	126.26	3871.09	125.73	3965.84	125.76	4005.74	127.25
4020.7	127.03	4045.63	129.79	4055.61	130.12	4080.54	126.23	4110.46	124.63
4175.29	124.86	4220.17	123.76	4265.05	124.01	4285	123.55	4314.92	123.47
4334.87	124.18	4349.83	125.69	4369.78	131.94	4374.76	132.82	4404.68	133.83
4424.63	133.99	4494.45	133.45	4634.08	131.65	4673.97	132.01	4748.77	131.89
4793.65	132.89	4813.6	132.73	4828.56	133.61	4843.52	133.48	4858.48	131.93
4883.42	133.14	4913.34	132.99	4942.56	131.82	5035.47	132.79	5051.63	133.33
5075.87	133.09	5090	133.2	5091	149.2	5259	149.2	5260	133.2
5276.36	132.51	5291.3	131.9	5316.21	132.11	5326.17	132.8	5356.06	133.53
5375.99	133.35	5390.93	132.54	5420.82	132.61	5445.73	131.75	5490.56	132.02
5510.49	131.13	5525.43	131.86	5535.39	131.31	5555.32	128.79	5565.28	130.7
5575.25	130.98	5585.21	129.47	5620.08	126.39	5635.02	127.4	5649.97	125.24
5664.91	121.75	5669.89	115.42	5674.88	120.84	5699.78	127.99	5709.75	129.97
5724.69	129.91	5749.6	132.97	5759.56	132.52	5784.47	138.37	5799.39	139.66
5824.2	138.26	5844.04	137.93	5868.84	138.65				

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1	2339 .035	2396 .1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	2339	2396		1501.45	1527.39	1537.6	.1 .3

PatuxentRiver.rep

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 1400 132.4 F  
 2720 5868.84 132.4 T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	130.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.22	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	129.94	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3567.20	352.24
100.97				
E.G. Slope (ft/ft)	0.002482	Area (sq ft)	4384.49	352.24
4910.17				
Q Total (cfs)	8893.00	Flow (cfs)	6428.38	2364.63
99.99				
Top Width (ft)	2689.64	Top Width (ft)	1305.67	57.00
1326.97				
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.71
0.99				
Max Chl Dpth (ft)	14.52	Hydr. Depth (ft)	3.80	6.18
1.55				
Conv. Total (cfs)	178504.9	Conv. (cfs)	129033.8	47464.1
2007.0				
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29
65.26				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.59	0.88
0.24				
Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	10082.99	7809.03
16127.27				
C & E Loss (ft)	0.04	Cum SA (acres)	2403.84	702.01
3484.73				

Warning: Divided flow computed for this cross-section.  
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	131.99	Element	Left OB	Channel
Vel Head (ft) 0.100	0.26	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 1537.60	131.73	Reach Len. (ft)	1501.45	1527.39
Crit W.S. (ft) 23.65	128.71	Flow Area (sq ft)	5244.54	454.06
E.G. Slope (ft/ft) 23.65	0.002273	Area (sq ft)	5669.12	454.06
Q Total (cfs) 25.61	15174.00	Flow (cfs)	11693.53	3454.87
Top Width (ft) 10.00	1106.00	Top Width (ft)	1039.00	57.00
Vel Total (ft/s) 1.08	2.65	Avg. Vel. (ft/s)	2.23	7.61
Max Chl Dpth (ft) 2.37	9.67	Hydr. Depth (ft)	5.59	7.97
Conv. Total (cfs) 537.1	318290.6	Conv. (cfs)	245284.0	72469.5
Length Wtd. (ft) 12.52	1517.47	Wetted Per. (ft)	939.20	62.29
Min Ch El (ft) 0.27	122.06	Shear (lb/sq ft)	0.79	1.03
Alpha 0.00	2.42	Stream Power (lb/ft s)	5868.84	0.00
Frctn Loss (ft) 21608.19	3.05	Cum Volume (acre-ft)	13162.81	10644.47
C & E Loss (ft) 2582.52	0.03	Cum SA (acres)	1653.21	711.27

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	133.28	Element	Left OB	Channel
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.035

PatuxentRiver.rep

0.100				
W.S. Elev (ft)	133.02	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	130.23	Flow Area (sq ft)	8833.41	527.45
1472.04				
E.G. Slope (ft/ft)	0.002407	Area (sq ft)	8833.41	527.45
9757.82				
Q Total (cfs)	26361.00	Flow (cfs)	20698.23	4563.55
1099.22				
Top Width (ft)	3747.96	Top Width (ft)	1531.88	57.00
2159.09				
Vel Total (ft/s)	2.43	Avg. Vel. (ft/s)	2.34	8.65
0.75				
Max Chl Dpth (ft)	17.59	Hydr. Depth (ft)	5.77	9.25
0.68				
Conv. Total (cfs)	537361.9	Conv. (cfs)	421927.9	93026.7
22407.2				
Length Wtd. (ft)	1517.62	Wetted Per. (ft)	1532.70	62.29
2170.46				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.87	1.27
0.10				
Alpha	2.92	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.26	Cum Volume (acre-ft)	23718.34	11517.67
34527.96				
C & E Loss (ft)	0.04	Cum SA (acres)	3274.73	711.74
4271.20				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	134.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	134.21	Reach Len. (ft)	1501.45	1527.39
1537.60				
Crit W.S. (ft)	131.43	Flow Area (sq ft)	10671.83	595.60
4294.07				

PatuxentRiver.rep

E.G. Slope (ft/ft)	0.002826	Area (sq ft)	10671.83	595.60
12594.17				
Q Total (cfs)	41717.00	Flow (cfs)	30583.02	6055.69
5078.30				
Top Width (ft)	4085.28	Top Width (ft)	1543.58	57.00
2484.69				
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)	2.87	10.17
1.18				
Max Chl Dpth (ft)	18.79	Hydr. Depth (ft)	6.91	10.45
1.73				
Conv. Total (cfs)	784707.3	Conv. (cfs)	575274.3	113909.0
95524.1				
Length Wtd. (ft)	1519.36	Wetted Per. (ft)	1544.46	62.29
2498.44				
Min Ch El (ft)	122.06	Shear (lb/sq ft)	1.22	1.69
0.30				
Alpha	2.95	Stream Power (lb/ft s)	5868.84	0.00
0.00				
Frctn Loss (ft)	3.31	Cum Volume (acre-ft)	34587.99	13686.98
48948.89				
C & E Loss (ft)	0.06	Cum SA (acres)	3682.01	713.60
4974.46				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 198588.0

INPUT

Description: old section 117 (Laurel study)

Station Elevation Data

num= 194

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	149.39	14.97	148	64.89	145.63	99.82	142.72	134.76	140.73
149.74	139.54	209.63	136.68	234.59	134.78	249.56	134.78	279.51	133.2
334.41	131.91	349.39	131.86	399.3	130.84	429.24	129.61	464.18	129.63
514.1	128.49	569	127.87	603.94	126.44	633.88	126.25	653.85	125.34
713.74	124.75	733.71	125.18	758.66	124.74	798.59	124.71	858.49	124.12
883.45	123.45	888.44	123.87	948.33	123.7	968.3	123.25	1003.23	124.28

PatuxentRiver.rep

1033.18	123.7	1078.1	124.71	1093.08	124.26	1113.04	124.95	1147.98	125.37
1157.96	124.94	1172.94	125.76	1192.9	125.36	1227.84	125.81	1247.8	126.59
1267.46	126.18	1275	125.76	1285	120.1	1300	119.57	1313	120.29
1325	126.09	1350.14	127.02	1380.01	126.12	1389.97	126.46	1419.84	126.23
1464.65	127.02	1474.61	126.48	1499.51	126.45	1514.44	127.05	1544.32	126.96
1549.3	126.32	1564.23	127.1	1579.17	126.26	1589.13	127.38	1609.04	126.35
1633.94	126.87	1648.87	127.74	1663.81	126.71	1683.73	126.34	1693.68	127.19
1718.58	127.02	1733.51	126.39	1828.11	125.52	1867.94	124.19	1937.65	124.37
1972.5	124.83	1997.4	123.46	2017.31	125.08	2047.18	125.39	2091.99	124.82
2116.89	125.31	2156.72	125	2181.62	125.26	2251.32	125.13	2321.03	123.98
2345.92	124.5	2375.8	124.47	2400.69	123.4	2425.59	124.43	2445.5	123.86
2490.33	124.3	2520.31	124.13	2555.28	123.31	2585.25	124.92	2625.22	124.61
2640.21	124.08	2665.19	124.53	2680.17	123.93	2725.14	123.82	2750.12	123.49
2775.1	124.15	2810.07	123.69	2845.04	124.13	2860.02	125.16	2870.02	124.27
2899.99	124.69	2909.98	124.15	2929.97	124.72	2949.95	124.2	2969.93	125.05
2984.92	124.21	3004.9	121.61	3034.88	124.47	3054.86	124.44	3064.85	125.23
3079.84	123.64	3104.82	124.58	3129.8	123.7	3144.79	125.46	3154.78	125.63
3169.77	124.3	3194.75	123.68	3224.72	123.88	3279.68	123.48	3309.65	124.02
3339.63	123.04	3459.53	123.07	3504.49	123.37	3529.47	124.59	3589.42	124.34
3609.4	124.54	3619.39	123.9	3639.38	124.65	3729.3	123.7	3759.28	125.54
3799.24	124.92	3849.2	125.33	3899.16	123.92	3934.13	125.59	3954.12	122.97
3969.1	125.15	3979.1	125.78	4004.07	125.29	4029.05	122.85	4039.05	122.62
4103.99	125.79	4138.96	125.11	4163.94	124.16	4223.9	124.02	4243.88	123.24
4253.87	123.84	4273.86	123.8	4313.83	122.61	4333.81	123.27	4358.79	123.37
4418.75	122.28	4438.73	123.01	4468.71	123.15	4498.68	122.56	4523.66	122.84
4558.64	122.11	4588.61	122.75	4658.56	121.92	4683.54	122.35	4726.94	122.06
4761.66	122.24	4805.07	121.91	4822.43	121.07	4848.47	121.93	4900.56	122.17
4930.94	121.6	4956.98	122.23	4974.34	122.1	5017.74	122.9	5043.79	122.76
5056.81	123.41	5087.77	122.18	5097.63	122.61	5107.48	121.63	5132.11	121.98
5137.03	121.07	5146.88	115.92	5151.81	118.44	5171.51	125.54	5176.63	127.22
5178.69	128.77	5188.69	128.77	5189.89	127.22	5208.58	122	5255.71	120
5265.93	120	5284.37	126	5359.48	128	5512.4	133.01	5542.09	134.48
5576.72	133.9	5611.36	134.33	5690.52	137.63	5710.31	138.19		

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1275 .035 1325 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1275 1325 993.28 988.41 937.73 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 3300 5710.31 129.4 T  
 Right Levee Station= 5184.61 Elevation= 132.25

CROSS SECTION OUTPUT Profile #10yr

PatuxentRiver.rep				
E.G. Elev (ft) Right OB	127.17	Element	Left OB	Channel
Vel Head (ft) 0.080	0.09	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 937.73	127.07	Reach Len. (ft)	993.28	988.41
Crit W.S. (ft) 4288.24	125.89	Flow Area (sq ft)	1548.23	289.52
E.G. Slope (ft/ft) 11333.60	0.001566	Area (sq ft)	1548.23	289.52
Q Total (cfs) 5816.03	8893.00	Flow (cfs)	1565.30	1511.67
Top Width (ft) 3802.24	4538.79	Top Width (ft)	686.56	50.00
Vel Total (ft/s) 1.36	1.45	Avg. Vel. (ft/s)	1.01	5.22
Max Chl Dpth (ft) 2.23	11.15	Hydr. Depth (ft)	2.26	5.79
Conv. Total (cfs) 146964.3	224715.8	Conv. (cfs)	39553.4	38198.1
Length Wtd. (ft) 1927.43	949.98	Wetted Per. (ft)	686.76	52.85
Min Ch El (ft) 0.22	119.57	Shear (lb/sq ft)	0.22	0.54
Alpha 5184.61	2.86	Stream Power (lb/ft s)	5710.31	0.00
Frctn Loss (ft) 15840.58	1.16	Cum Volume (acre-ft)	9980.74	7797.78
C & E Loss (ft) 3394.21	0.01	Cum SA (acres)	2369.51	700.14

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	128.91	Element	Left OB	Channel
Vel Head (ft) 0.080	0.15	Wt. n-Val.	0.100	0.035
W.S. Elev (ft)	128.76	Reach Len. (ft)	993.28	988.41

PatuxentRiver.rep

937.73				
Crit W.S. (ft)	126.96	Flow Area (sq ft)	2183.31	373.73
5039.70				
E.G. Slope (ft/ft)	0.001790	Area (sq ft)	2183.31	373.73
5039.70				
Q Total (cfs)	15174.00	Flow (cfs)	3531.88	2473.52
9168.60				
Top Width (ft)	2000.00	Top Width (ft)	525.00	50.00
1425.00				
Vel Total (ft/s)	2.00	Avg. Vel. (ft/s)	1.62	6.62
1.82				
Max Chl Dpth (ft)	9.19	Hydr. Depth (ft)	4.16	7.47
3.54				
Conv. Total (cfs)	358617.4	Conv. (cfs)	83471.3	58458.3
216687.7				
Length Wtd. (ft)	948.45	Wetted Per. (ft)	529.03	52.85
1430.93				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.46	0.79
0.39				
Alpha	2.44	Stream Power (lb/ft s)	5710.31	0.00
5184.61				
Frctn Loss (ft)	1.59	Cum Volume (acre-ft)	13027.48	10629.96
21518.83				
C & E Loss (ft)	0.03	Cum SA (acres)	1626.26	709.40
2557.19				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	129.99	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	129.85	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)	127.02	Flow Area (sq ft)	3635.96	428.07
10590.65				
E.G. Slope (ft/ft)	0.001927	Area (sq ft)	3635.96	428.07
22007.02				
Q Total (cfs)	26361.00	Flow (cfs)	6241.08	3217.59



PatuxentRiver.rep

16902.33				
Top Width (ft)	4761.10	Top Width (ft)	851.49	50.00
3859.61				
Vel Total (ft/s)	1.80	Avg. Vel. (ft/s)	1.72	7.52
1.60				
Max Chl Dpth (ft)	13.93	Hydr. Depth (ft)	4.27	8.56
2.74				
Conv. Total (cfs)	600520.4	Conv. (cfs)	142175.8	73298.8
385045.8				
Length Wtd. (ft)	949.75	Wetted Per. (ft)	851.73	52.85
3867.19				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.51	0.97
0.33				
Alpha	2.85	Stream Power (lb/ft s)	5710.31	0.00
5184.61				
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)	23503.44	11500.92
33967.34				
C & E Loss (ft)	0.01	Cum SA (acres)	3233.66	709.86
4164.98				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	131.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	131.03	Reach Len. (ft)	993.28	988.41
937.73				
Crit W.S. (ft)	127.71	Flow Area (sq ft)	4664.14	487.41
15171.40				
E.G. Slope (ft/ft)	0.001735	Area (sq ft)	4664.14	487.41
26587.77				
Q Total (cfs)	41717.00	Flow (cfs)	8739.14	3790.26
29187.60				
Top Width (ft)	4794.71	Top Width (ft)	885.10	50.00
3859.61				
Vel Total (ft/s)	2.05	Avg. Vel. (ft/s)	1.87	7.78
1.92				
Max Chl Dpth (ft)	15.11	Hydr. Depth (ft)	5.27	9.75

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3.93				
Conv. Total (cfs)	1001637.0	Conv. (cfs)	209829.1	91005.2
700802.4				
Length Wtd. (ft)	947.96	Wetted Per. (ft)	885.36	52.85
3868.38				
Min Ch El (ft)	119.57	Shear (lb/sq ft)	0.57	1.00
0.42				
Alpha	2.09	Stream Power (lb/ft s)	5710.31	0.00
5184.61				
Frctn Loss (ft)	1.55	Cum Volume (acre-ft)	34323.68	13668.00
48257.36				
C & E Loss (ft)	0.01	Cum SA (acres)	3640.15	711.73
4862.49				

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 197599.6

INPUT

Description: old section 116 (Laurel study)

Station Elevation Data num= 200

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.54	9.98	138.69	29.95	137.94	64.89	135.54	74.87	135.17
99.82	135.02	119.79	135.47	159.72	133.91	169.7	132.9	189.67	132.97
219.61	131.84	244.57	131.51	314.45	129.86	369.35	129.59	384.32	129.26
414.27	129.22	434.24	128.76	444.22	129.07	469.17	128.37	524.08	128.65
578.98	127.48	608.93	128.1	643.87	128.5	693.78	130.24	713.74	130
743.69	130.86	758.66	131.69	773.64	131.54	818.56	131.77	838.52	132.09
848.51	131.75	863.48	133.73	873.46	134.14	883.44	133.24	905	126.93
945	124.89	954	121.64	963	120.9	967	119.69	980	117.91
991	118.52	1000	125.86	1028.19	124.94	1058.14	124.73	1068.12	124.28
1083.09	124.53	1103.06	123.82	1118.03	124.7	1152.97	123.36	1177.93	123.52
1202.88	123.1	1232.83	123.23	1272.76	123.04	1337.64	123.22	1417.5	122.71
1502.35	122.98	1567.24	123	1612.16	122.51	1672.06	122.97	1751.92	122.84
1771.88	122.56	1806.82	122.48	1841.76	122.02	1881.69	121.89	1926.61	122.32
1941.58	122.65	1991.49	121.85	2041.41	122.51	2086.33	122.1	2121.26	122.36
2151.21	122	2166.19	121.15	2196.13	121.68	2216.1	122.64	2246.05	123.18
2271.01	123.19	2280.99	122.87	2345.91	124.06	2390.85	123.77	2410.83	123.8

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2440.79	124.24	2495.72	123.2	2545.66	123.73	2585.61	123.18	2600.59	123.28
2625.56	122.81	2660.51	123.68	2685.48	124.02	2705.45	123.97	2715.44	122.85
2730.42	123.58	2740.41	122.81	2750.4	123.42	2760.38	123.3	2775.36	123.86
2790.35	123.43	2805.33	124.57	2810.32	124.12	2830.3	120.2	2835.29	120.38
2855.26	123.56	2870.24	123.17	2885.23	124.25	2925.17	123.87	2955.14	124.73
2980.1	124.2	3025.05	122.18	3035.03	122.02	3109.94	122.07	3134.91	122.72
3154.88	122.59	3194.83	122.91	3254.76	122.65	3274.73	123.3	3299.7	123.62
3319.67	123.2	3329.66	123.6	3349.64	123.58	3399.57	122.47	3454.5	122.77
3509.43	121.92	3524.41	121.06	3544.39	121.12	3574.35	122.26	3589.33	121.31
3604.31	123.23	3614.3	123.65	3669.23	122.99	3684.21	121.73	3704.18	121.1
3784.08	121.08	3804.06	122.1	3834.02	121.54	3849	122.39	3873.97	122.13
3903.93	123.18	3948.87	122.71	3973.84	122.77	4003.8	122.36	4053.74	122.01
4072.68	122.13	4123.8	121.34	4142.39	121.5	4151.68	121.04	4179.57	121.35
4235.34	121.31	4292.66	120.32	4302.58	120.81	4322.42	121.02	4342.25	119.66
4362.09	119.14	4381.93	119.17	4391.84	120.2	4411.68	120.77	4431.52	120.78
4451.35	118.36	4456.31	115.62	4476.15	120.11	4491.02	124.76	4500.94	126.53
4505.9	127.27	4525	127.27	4550.53	122.94	4580.29	121.32	4605.11	120.49
4620.08	121.3	4635.04	120.27	4669.96	119.1	4689.92	117.72	4784.71	117.73
4809.65	117.72	4849.56	117.88	4869.52	118.61	4884.48	118.45	4904.44	118.8
4934.37	122.13	4969.29	123.67	5034.14	125.08	5074.05	125.14	5089.02	125.68
5113.96	125.53	5128.93	126.29	5153.88	126.73	5168.84	128.87	5178.82	129.47
5188.8	128.42	5203.76	129.61	5213.74	129.09	5223.72	130.23	5238.68	130.13
5263.63	130.48	5278.59	130.19	5308.53	131.4	5348.44	130.58	5373.38	131.33
5413.29	130.67	5428.26	131.19	5438.23	132.72	5458.19	131.48	5478.15	131.05

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.04	578.98	.1	963	.035	1000	.08	4431.52	.035
4505.9	.05								

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	963	1000	1000.4	1030.79	1005.5	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
3300	5478.15	127.1	T
Right Levee	Station=	4505.9	Elevation= 130.5

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	126.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.95	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	124.38	Flow Area (sq ft)	77.21	234.41
6655.22				

PatuxentRiver.rep				
E.G. Slope (ft/ft)	0.000973	Area (sq ft)	77.21	234.41
11670.83				
Q Total (cfs)	8893.00	Flow (cfs)	56.08	1010.18
7826.75				
Top Width (ft)	3573.42	Top Width (ft)	38.74	37.00
3497.68				
Vel Total (ft/s)	1.28	Avg. Vel. (ft/s)	0.73	4.31
1.18				
Max Chl Dpth (ft)	10.33	Hydr. Depth (ft)	1.99	6.34
2.89				
Conv. Total (cfs)	285104.8	Conv. (cfs)	1797.8	32385.8
250921.2				
Length Wtd. (ft)	1011.54	Wetted Per. (ft)	39.37	39.93
2301.22				
Min Ch El (ft)	117.91	Shear (lb/sq ft)	0.12	0.36
0.18				
Alpha	2.04	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	1.80	Cum Volume (acre-ft)	9962.21	7791.83
15592.96				
C & E Loss (ft)	0.05	Cum SA (acres)	2361.24	699.15
3315.63				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	127.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.		0.035
0.080				
W.S. Elev (ft)	127.25	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	124.08	Flow Area (sq ft)		29.71
9789.41				
E.G. Slope (ft/ft)	0.001573	Area (sq ft)		29.71
14327.51				
Q Total (cfs)	15174.00	Flow (cfs)		75.16

PatuxentRiver.rep

15098.84				
Top Width (ft)	3230.00	Top Width (ft)		7.00
3223.00				
Vel Total (ft/s)	1.55	Avg. Vel. (ft/s)		2.53
1.54				
Max Chl Dpth (ft)	7.10	Hydr. Depth (ft)		4.24
3.04				
Conv. Total (cfs)	382651.9	Conv. (cfs)		1895.4
380756.5				
Length Wtd. (ft)	1008.72	Wetted Per. (ft)		16.13
3230.56				
Min Ch El (ft)	120.15	Shear (lb/sq ft)		0.18
0.30				
Alpha	1.00	Stream Power (lb/ft s)	5478.15	0.00
4505.90				
Frctn Loss (ft)	2.36	Cum Volume (acre-ft)	13002.59	10625.38
21310.37				
C & E Loss (ft)	0.04	Cum SA (acres)	1620.27	708.75
2507.16				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	128.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.098	0.035
0.080				
W.S. Elev (ft)	128.24	Reach Len. (ft)	1000.40	1030.79
1005.50				
Crit W.S. (ft)	125.41	Flow Area (sq ft)	230.99	319.08
13288.29				
E.G. Slope (ft/ft)	0.001563	Area (sq ft)	230.99	319.08
19688.14				
Q Total (cfs)	26361.00	Flow (cfs)	274.48	2140.29
23946.23				
Top Width (ft)	3682.69	Top Width (ft)	139.79	37.00
3505.90				

PatuxentRiver.rep

Vel Total (ft/s) 1.80	1.90	Avg. Vel. (ft/s)	1.19	6.71
Max Chl Dpth (ft) 3.79	12.62	Hydr. Depth (ft)	1.65	8.62
Conv. Total (cfs) 605796.2	666885.6	Conv. (cfs)	6943.9	54145.5
Length Wtd. (ft) 3510.91	1008.80	Wetted Per. (ft)	140.64	39.93
Min Ch El (ft) 0.37	117.91	Shear (lb/sq ft)	0.16	0.78
Alpha 4505.90	1.82	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 33518.54	2.42	Cum Volume (acre-ft)	23459.35	11492.44
C & E Loss (ft) 4085.70	0.03	Cum SA (acres)	3222.36	708.88

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	129.61	Element	Left OB	Channel
Vel Head (ft) 0.079	0.12	Wt. n-Val.	0.081	0.035
W.S. Elev (ft) 1005.50	129.49	Reach Len. (ft)	1000.40	1030.79
Crit W.S. (ft) 17700.73	126.00	Flow Area (sq ft)	568.35	365.65
E.G. Slope (ft/ft) 24100.58	0.001536	Area (sq ft)	568.35	365.65
Q Total (cfs) 38321.57	41717.00	Flow (cfs)	732.47	2662.96
Top Width (ft) 3505.90	3908.40	Top Width (ft)	365.50	37.00
Vel Total (ft/s) 2.16	2.24	Avg. Vel. (ft/s)	1.29	7.28

PatuxentRiver.rep

Max Chl Dpth (ft) 5.05	13.87	Hydr. Depth (ft)	1.56	9.88
Conv. Total (cfs) 977786.1	1064422.0	Conv. (cfs)	18689.2	67946.3
Length Wtd. (ft) 3512.17	1007.91	Wetted Per. (ft)	366.58	39.93
Min Ch El (ft) 0.48	117.91	Shear (lb/sq ft)	0.15	0.88
Alpha 4505.90	1.54	Stream Power (lb/ft s)	5478.15	0.00
Frctn Loss (ft) 47711.76	2.07	Cum Volume (acre-ft)	34264.03	13658.32
C & E Loss (ft) 4783.21	0.02	Cum SA (acres)	3625.89	710.74

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196568.8

INPUT

Description: Additional Cross Section 115.5

Station Elevation Data

num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	142	207	132	228	124	337	122	338	122
346	117.08	366	115.84	386	116.96	394	121.98	418	122.08
561	122.27	692	121.86	847	122.31	1035	121.75	1174	122
1344	121.73	1552	122	1667	122.39	1819	122.59	1973	122.35
2084	122	2139	122	2150	120	2155	119.21	2161	120
2168	122	2258	122.25	2331	121.7	2333	120.83	2337	120.87
2341	122.18	2413	122.64	2485	122.76	2605	122.52	2846	122.76
2870	122.19	2884	122.67	2903	122.25	2915	119.6	2925	119.82
2936	121.57	3084	122.8	3272	123.06	3393	122.44	3462	122.2
3532	121.8	3550	121.7	3600	117.15	3622	117.15	3624	120
3645	127.7	3660	127.8	3857	127.3	3978	126	4028	114
4123	114	4153	124	4200	124	4296	124	4383	126
4607	130								

PatuxentRiver.rep

Manning's n Values num= 5  
 Sta n Val Sta n Val Sta n Val Sta n Val  
 0 .1 338 .035 394 .08 3550 .035 3660 .055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 338 394 208 212 210 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 2780 4607 128 T

Right Levee Station= 3660 Elevation= 127.8

Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 3790 4495 126

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	124.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.50	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	123.65	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	123.63	Flow Area (sq ft)	75.46	354.89
3533.62				
E.G. Slope (ft/ft)	0.004268	Area (sq ft)	75.46	354.89
4848.62				
Q Total (cfs)	8893.00	Flow (cfs)	64.79	3258.90
5569.31				
Top Width (ft)	3386.64	Top Width (ft)	90.70	56.00
3239.94				
Vel Total (ft/s)	2.24	Avg. Vel. (ft/s)	0.86	9.18
1.58				
Max Chl Dpth (ft)	7.81	Hydr. Depth (ft)	0.83	6.34
1.48				
Conv. Total (cfs)	136129.6	Conv. (cfs)	991.8	49885.6
85252.2				
Length Wtd. (ft)	210.79	Wetted Per. (ft)	90.72	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.22	1.61
0.39				
Alpha	6.45	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	9960.46	7784.86
15402.30				
C & E Loss (ft)	0.01	Cum SA (acres)	2359.75	698.05
3237.87				



PatuxentRiver.rep

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	124.89	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.40	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.49	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	124.11	Flow Area (sq ft)	82.15	402.29
5553.37				
E.G. Slope (ft/ft)	0.003850	Area (sq ft)	82.15	402.29
6886.88				
Q Total (cfs)	15174.00	Flow (cfs)	122.74	3814.46
11236.80				
Top Width (ft)	3150.00	Top Width (ft)	38.00	56.00
3056.00				
Vel Total (ft/s)	2.51	Avg. Vel. (ft/s)	1.49	9.48
2.02				
Max Chl Dpth (ft)	8.65	Hydr. Depth (ft)	2.16	7.18
2.33				
Conv. Total (cfs)	244564.0	Conv. (cfs)	1978.3	61478.8
181106.9				
Length Wtd. (ft)	210.52	Wetted Per. (ft)	39.82	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.50	1.64
0.56				
Alpha	4.06	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.71	Cum Volume (acre-ft)	13001.65	10620.27
21065.52				
C & E Loss (ft)	0.02	Cum SA (acres)	1619.84	708.01
2434.69				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	125.90	Element	Left OB	Channel
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PatuxentRiver.rep

Right OB				
Vel Head (ft)	0.42	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	125.48	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	124.75	Flow Area (sq ft)	276.92	457.72
7914.89				
E.G. Slope (ft/ft)	0.004123	Area (sq ft)	276.92	457.72
10802.54				
Q Total (cfs)	26361.00	Flow (cfs)	476.90	4894.80
20989.30				
Top Width (ft)	3414.84	Top Width (ft)	113.89	56.00
3244.95				
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)	1.72	10.69
2.65				
Max Chl Dpth (ft)	9.64	Hydr. Depth (ft)	2.43	8.17
3.32				
Conv. Total (cfs)	410562.1	Conv. (cfs)	7427.6	76234.5
326900.0				
Length Wtd. (ft)	210.38	Wetted Per. (ft)	114.18	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.62	2.00
0.85				
Alpha	2.89	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	23453.52	11483.25
33166.63				
C & E Loss (ft)	0.01	Cum SA (acres)	3219.44	707.78
4007.78				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	127.52	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	127.19	Reach Len. (ft)	208.00	212.00
210.00				
Crit W.S. (ft)	125.41	Flow Area (sq ft)	475.74	553.59
11999.55				
E.G. Slope (ft/ft)	0.002886	Area (sq ft)	475.74	553.59
16361.66				

PatuxentRiver.rep				
Q Total (cfs)	41717.00	Flow (cfs)	956.65	5622.80
35137.55				
Top Width (ft)	3424.00	Top Width (ft)	118.38	56.00
3249.62				
Vel Total (ft/s)	3.20	Avg. Vel. (ft/s)	2.01	10.16
2.93				
Max Chl Dpth (ft)	11.35	Hydr. Depth (ft)	4.02	9.89
5.03				
Conv. Total (cfs)	776527.6	Conv. (cfs)	17807.3	104663.8
654056.6				
Length Wtd. (ft)	210.24	Wetted Per. (ft)	118.99	58.91
2386.97				
Min Ch El (ft)	115.84	Shear (lb/sq ft)	0.72	1.69
0.91				
Alpha	2.07	Stream Power (lb/ft s)	4607.00	0.00
3660.00				
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	34252.04	13647.44
47244.77				
C & E Loss (ft)	0.04	Cum SA (acres)	3620.33	709.64
4705.24				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 196356.8

#### INPUT

Description: CG - old section 115 (Laurel study)

Station Elevation Data num= 126									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	162.4	29.52	160.86	54.12	160.51	98.41	158.32	113.17	156.97
123.01	156.92	201.73	153.7	226.33	152.47	246.01	152.38	270.61	150.96
305.06	147.46	324.93	143.28	344.81	136.17	379.6	127.21	404.44	122.5
419.35	120.57	434.26	122.26	449.17	122.91	473	123.5	479	116.34
510	115.42	539	116.55	542	123.32	608.47	123.35	623.44	122.54
638.41	123.27	653.39	122.07	678.34	122.13	738.23	121.74	753.21	121.96
853.03	121.87	887.97	122.32	912.92	121.75	947.86	121.74	982.8	120.86
1012.74	120.61	1122.55	120.59	1207.4	121.33	1237.34	120.32	1267.29	120.63
1297.24	120.36	1307.22	120.74	1367.11	120.32	1412.03	120.34	1436.99	120.93
1481.91	120.69	1501.87	120.08	1546.79	121.4	1571.75	120.27	1636.63	120.22
1686.54	120.59	1766.4	120.84	1776.38	120.47	1801.34	121.27	1821.3	120.89
1841.27	121.15	1871.21	120.85	1901.16	121.44	2005.97	121.75	2020.94	121

PatuxentRiver.rep

2040.91	121.08	2055.88	121.94	2085.83	121.58	2110.79	122.36	2140.73	121.88
2175.67	122.53	2195.64	121.18	2205.62	122.63	2215.6	122.79	2240.56	121.59
2250.54	120.38	2270.5	122.19	2290.47	122.3	2310.43	118.35	2330.4	122.99
2340.38	122.65	2385.3	121.66	2430.22	122.66	2440.21	123.12	2460.17	122.58
2480.14	122.79	2510.08	122.28	2545.02	122.14	2614.9	120.96	2649.84	121.21
2684.77	122	2734.69	120.83	2779.61	120.37	2804.56	120.78	2839.5	120.7
2859.47	121.24	2919.43	121.43	2959.42	120.95	3014.42	120.84	3054.42	121.1
3074.41	120.55	3094.41	121.05	3114.41	120.4	3139.41	121.08	3174.4	119.31
3189.4	119.39	3209.4	120.54	3239.4	121.07	3319.39	121.08	3329.39	120.92
3354.39	119	3369.38	120.02	3389.38	120.57	3419.38	119.33	3444.38	121.09
3479.37	122.88	3509.37	123.16	3580	122	3618	117.09	3668	117.09
3672	119.25	3707	119.25	3717	124	3747	124.229	3750	124.252
3979	126	4595	126	4614	124	4671	124	4679	126
4959	126								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	473	.035	542	.08	3580	.035	3717	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

473	542	758.14	773.69	678.9	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2950	4959	124.6	T

Right Levee Station= 3979 Elevation= 126

Blocked Obstructions num= 1

Sta L	Sta R	Elev
4595	4679	126

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	123.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.58	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	122.64	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	122.64	Flow Area (sq ft)	36.51	427.51
3142.33				
E.G. Slope (ft/ft)	0.004478	Area (sq ft)	36.51	427.51
4747.42				
Q Total (cfs)	8893.00	Flow (cfs)	34.41	3878.10
4980.50				
Top Width (ft)	3037.35	Top Width (ft)	39.32	67.98
2930.05				
Vel Total (ft/s)	2.47	Avg. Vel. (ft/s)	0.94	9.07
1.58				

PatuxentRiver.rep				
Max Chl Dpth (ft) 1.41	7.22	Hydr. Depth (ft)	0.93	6.29
Conv. Total (cfs) 74430.7	132900.9	Conv. (cfs)	514.2	57956.0
Length Wtd. (ft) 2233.68	704.13	Wetted Per. (ft)	39.56	74.92
Min Ch El (ft) 0.39	115.42	Shear (lb/sq ft)	0.26	1.60
Alpha 3979.00	6.13	Stream Power (lb/ft s)	4959.00	0.00
Frctn Loss (ft) 15379.17	1.49	Cum Volume (acre-ft)	9960.19	7782.96
C & E Loss (ft) 3223.00	0.15	Cum SA (acres)	2359.44	697.75

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth

for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

#### CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	124.16	Element	Left OB	Channel
Vel Head (ft) 0.080	0.32	Wt. n-Val.		0.035
W.S. Elev (ft) 678.90	123.83	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 5939.46	123.23	Flow Area (sq ft)		506.16

PatuxentRiver.rep

E.G. Slope (ft/ft)	0.002998	Area (sq ft)	506.16
7682.73			
Q Total (cfs)	15174.00	Flow (cfs)	4151.23
11022.77			
Top Width (ft)	3075.00	Top Width (ft)	67.00
3008.00			
Vel Total (ft/s)	2.35	Avg. Vel. (ft/s)	8.20
1.86			
Max Chl Dpth (ft)	8.41	Hydr. Depth (ft)	7.55
2.47			
Conv. Total (cfs)	277111.9	Conv. (cfs)	75810.9
201301.1			
Length Wtd. (ft)	698.36	Wetted Per. (ft)	76.39
2409.66			
Min Ch El (ft)	115.42	Shear (lb/sq ft)	1.24
0.46			
Alpha	3.77	Stream Power (lb/ft s)	4959.00
3979.00			0.00
Frctn Loss (ft)	1.68	Cum Volume (acre-ft)	13001.45
21030.40			10618.06
C & E Loss (ft)	0.06	Cum SA (acres)	1619.74
2420.08			707.71

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	125.00	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	124.52	Reach Len. (ft)	758.14	773.69
678.90				
Crit W.S. (ft)	123.91	Flow Area (sq ft)	161.90	556.84
7601.69				
E.G. Slope (ft/ft)	0.004428	Area (sq ft)	161.90	556.84
10644.84				
Q Total (cfs)	26361.00	Flow (cfs)	256.87	5894.16
20209.97				
Top Width (ft)	3391.58	Top Width (ft)	79.22	69.00
3243.36				

PatuxentRiver.rep

Vel Total (ft/s) 2.66	3.17	Avg. Vel. (ft/s)	1.59	10.58
Max Chl Dpth (ft) 3.16	9.10	Hydr. Depth (ft)	2.04	8.07
Conv. Total (cfs) 303704.1	396138.3	Conv. (cfs)	3860.1	88574.1
Length Wtd. (ft) 2409.66	695.26	Wetted Per. (ft)	79.65	76.78
Min Ch El (ft) 0.87	115.42	Shear (lb/sq ft)	0.56	2.00
Alpha 3979.00	3.04	Stream Power (lb/ft s)	4959.00	0.00
Frctn Loss (ft) 33114.93	1.18	Cum Volume (acre-ft)	23452.47	11480.78
C & E Loss (ft) 3992.14	0.12	Cum SA (acres)	3218.98	707.47

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	127.00	Element	Left OB	Channel
Vel Head (ft) 0.078	0.21	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 678.90	126.79	Reach Len. (ft)	758.14	773.69
Crit W.S. (ft) 15976.63	124.58	Flow Area (sq ft)	355.44	713.56
E.G. Slope (ft/ft) 19085.42	0.001889	Area (sq ft)	355.44	713.56
Q Total (cfs) 35331.98	41717.00	Flow (cfs)	565.76	5819.26
Top Width (ft) 4417.00	4577.20	Top Width (ft)	91.20	69.00
Vel Total (ft/s) 2.21	2.45	Avg. Vel. (ft/s)	1.59	8.16
Max Chl Dpth (ft)	11.37	Hydr. Depth (ft)	3.90	10.34

PatuxentRiver.rep

3.62				
Conv. Total (cfs)	959951.1	Conv. (cfs)	13018.7	133907.2
813025.2				
Length Wtd. (ft)	692.92	Wetted Per. (ft)	91.85	76.78
4421.78				
Min Ch El (ft)	115.42	Shear (lb/sq ft)	0.46	1.10
0.43				
Alpha	2.25	Stream Power (lb/ft s)	4959.00	0.00
3979.00				
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)	34250.05	13644.36
47159.32				
C & E Loss (ft)	0.05	Cum SA (acres)	3619.83	709.34
4686.76				

Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 195583.1

INPUT

Description: old section 114 (Laurel study)

Station Elevation Data num= 122

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	160.17	64.03	124	78	122	252.29	121.43	282.21	121.34
297.16	120.78	431.8	120.78	456.73	121.07	481.66	120.78	621.28	120.91
681.12	121.76	701.07	121.78	716.03	120.83	760.9	120.82	780.85	121.75
790.82	120.81	820.74	122.18	855.65	120.78	890.55	121.16	905.51	122.09
945.4	121.51	975	122.56	986	114.29	990	113.45	1011	116.56
1021	117.15	1025	122.19	1089.93	121.57	1099.9	121.92	1144.78	121.36
1159.74	120.47	1189.67	120.41	1249.51	119.49	1329.3	119.31	1359.22	118.64
1374.18	119.43	1399.12	119.09	1473.92	118.84	1498.86	119.48	1533.76	118.82
1563.69	119.42	1588.62	118.53	1708.31	118.56	1763.16	119.09	1778.12	119.9
1793.09	119.1	1808.05	119.92	1872.88	119.34	1907.78	120.12	1947.68	119.54
1997.55	120.61	2042.43	120.2	2082.33	121.24	2122.22	120.6	2137.18	121.48
2157.16	120.13	2172.16	120.76	2187.15	120.04	2222.14	121.48	2242.13	120.13
2267.13	121.3	2292.12	120.26	2312.11	120.01	2322.11	120.78	2357.09	118.1
2372.09	119.08	2387.08	116.83	2402.08	120.07	2412.08	120.91	2432.07	120.32



PatuxentRiver.rep

2442.07	121.1	2467.06	121.04	2472.06	122.15	2497.05	120.54	2507.04	121.34
2537.03	120.57	2552.03	117.27	2572.02	119.23	2587.02	119.51	2607.01	120.91
2627	120.86	2656.99	119.77	2666.99	120.06	2686.98	118.84	2696.98	119.33
2721.97	118.7	2736.97	119.5	2766.95	119.1	2796.94	119.52	2811.94	118.65
2871.92	119.06	2891.91	118.66	2951.89	118.55	3001.87	119.49	3036.86	118.42
3066.85	119.72	3091.84	118.88	3101.84	119.78	3146.82	117.77	3165	115.97
3195	115.97	3198	117.25	3230	117.25	3242	113.27	3550	113.27
3569	124	4282	124	4331	116	4364	116	4407	124
4696	126	4870	126	4885	124	4915	116	5189	116
5366	120	5580	120	5613	122	5705	124	5743	126
5965	126	6001	128						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	975	.035	1025	.08	3146.82	.035	3195	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

975	1025	614.52	765.33	638.85	.1	.3
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Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
3200	6001	115	T

Right Levee Station= 3200 Elevation= 117.25

Blocked Obstructions num= 1

Sta L	Sta R	Elev
4282	5705	124

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	120.65	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.		0.035
0.058				
W.S. Elev (ft)	120.58	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	117.73	Flow Area (sq ft)		212.27
4272.05				
E.G. Slope (ft/ft)	0.001230	Area (sq ft)		212.27
4812.06				
Q Total (cfs)	8893.00	Flow (cfs)		826.64
8066.36				
Top Width (ft)	2125.74	Top Width (ft)		46.09
2079.65				
Vel Total (ft/s)	1.98	Avg. Vel. (ft/s)		3.89
1.89				
Max Chl Dpth (ft)	7.31	Hydr. Depth (ft)		4.61
2.05				
Conv. Total (cfs)	253562.8	Conv. (cfs)		23569.7

PatuxentRiver.rep

229993.1				
Length Wtd. (ft)	648.93	Wetted Per. (ft)		50.19
2084.31				
Min Ch El (ft)	113.45	Shear (lb/sq ft)		0.32
0.16				
Alpha	1.18	Stream Power (lb/ft s)	6001.00	0.00
3200.00				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	9959.87	7777.27
15304.68				
C & E Loss (ft)	0.01	Cum SA (acres)	2359.10	696.73
3183.96				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	122.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.069				
W.S. Elev (ft)	122.30	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	120.52	Flow Area (sq ft)	636.25	294.42
6457.46				
E.G. Slope (ft/ft)	0.001980	Area (sq ft)	636.25	294.42
6562.32				
Q Total (cfs)	15174.00	Flow (cfs)	453.09	1700.30
13020.61				
Top Width (ft)	2892.24	Top Width (ft)	567.59	49.65
2275.00				
Vel Total (ft/s)	2.05	Avg. Vel. (ft/s)	0.71	5.78
2.02				
Max Chl Dpth (ft)	9.03	Hydr. Depth (ft)	1.12	5.93
2.84				
Conv. Total (cfs)	340967.8	Conv. (cfs)	10181.2	38206.6
292580.0				
Length Wtd. (ft)	649.08	Wetted Per. (ft)	569.32	55.09
2287.24				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.14	0.66
0.35				
Alpha	1.72	Stream Power (lb/ft s)	6001.00	0.00
3200.00				
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	12995.91	10610.95
20919.39				
C & E Loss (ft)	0.02	Cum SA (acres)	1614.81	706.67

2378.91

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	123.70	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.066				
W.S. Elev (ft)	123.62	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	120.11	Flow Area (sq ft)	2138.16	360.73
11724.86				
E.G. Slope (ft/ft)	0.000889	Area (sq ft)	2138.16	360.73
12264.87				
Q Total (cfs)	26361.00	Flow (cfs)	1675.77	1589.63
23095.60				
Top Width (ft)	3501.68	Top Width (ft)	908.35	50.00
2543.34				
Vel Total (ft/s)	1.85	Avg. Vel. (ft/s)	0.78	4.41
1.97				
Max Chl Dpth (ft)	10.35	Hydr. Depth (ft)	2.35	7.21
4.61				
Conv. Total (cfs)	884165.0	Conv. (cfs)	56206.4	53317.3
774641.3				
Length Wtd. (ft)	644.98	Wetted Per. (ft)	908.69	55.53
2549.27				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.13	0.36
0.26				
Alpha	1.34	Stream Power (lb/ft s)	6001.00	0.00
3200.00				
Frctn Loss (ft)	0.51	Cum Volume (acre-ft)	23432.46	11472.63
32936.41				
C & E Loss (ft)	0.00	Cum SA (acres)	3210.39	706.41
3947.05				

CROSS SECTION OUTPUT Profile #500yr

PatuxentRiver.rep				
E.G. Elev (ft)	126.29	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.035
0.069				
W.S. Elev (ft)	126.25	Reach Len. (ft)	614.52	765.33
638.85				
Crit W.S. (ft)	120.97	Flow Area (sq ft)	4530.63	491.82
22643.38				
E.G. Slope (ft/ft)	0.000573	Area (sq ft)	4530.63	491.82
23183.38				
Q Total (cfs)	41717.00	Flow (cfs)	4677.10	2138.98
34900.93				
Top Width (ft)	5909.38	Top Width (ft)	914.95	50.00
4944.43				
Vel Total (ft/s)	1.51	Avg. Vel. (ft/s)	1.03	4.35
1.54				
Max Chl Dpth (ft)	12.98	Hydr. Depth (ft)	4.95	9.84
4.58				
Conv. Total (cfs)	1743253.0	Conv. (cfs)	195444.5	89382.6
1458426.0				
Length Wtd. (ft)	643.18	Wetted Per. (ft)	915.91	55.53
4950.67				
Min Ch El (ft)	113.45	Shear (lb/sq ft)	0.18	0.32
0.16				
Alpha	1.35	Stream Power (lb/ft s)	6001.00	0.00
3200.00				
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	34207.54	13633.65
46829.93				
C & E Loss (ft)	0.00	Cum SA (acres)	3611.08	708.28
4613.81				

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 194817.8

INPUT

Description: old section 113.1 (Laurel study)

Station Elevation Data

num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	158.5	127	156	166	154	172	152	178	150
192	148	208	146	234	144	256	142	306	140
337	138	361	136	377	134	388	132	421	122
422.97	121.58	437.9	121.01	462.78	122.09	487.66	120.76	502.59	120.86
512.54	121.77	532.45	120.88	557.33	121.29	572.26	120.72	587.18	121.09

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612.07	120.97	626.99	120.29	641.92	120.64	666.8	120.26	761.35	120.3
781.25	120.96	786.23	120.43	801.16	121.03	811.11	120.13	835.99	120.66
850	121.5	880	122.06	891	113.79	895	112.95	916	116.06
926	116.65	930	121.69	959	121.22	1030.32	120.44	1040.29	119.67
1060.23	120.22	1070.2	119.63	1100.11	119.4	1110.08	119.75	1135	119.4
1164.91	119.82	1189.84	119.35	1209.78	119.53	1229.72	118.62	1249.66	119.09
1299.51	119	1309.47	117.93	1334.4	118.04	1349.35	118.77	1384.25	117.48
1409.17	117.78	1444.07	117.38	1468.99	117.4	1493.91	117.92	1518.84	117.39
1543.76	117.39	1578.66	118.24	1613.55	117.98	1628.51	118.63	1663.41	119.08
1683.4	118.87	1703.39	119.27	1738.37	118.93	1768.36	118.27	1803.34	119
1838.32	118.41	1853.32	119.13	1883.3	119.16	1898.29	118.75	1923.28	117.23
1953.26	117.21	1988.25	117.67	2008.24	117.33	2023.23	118.67	2038.22	118.25
2063.21	119.52	2088.19	118.91	2098.19	119.57	2128.17	118.54	2158.16	116.38
2173.15	117.72	2198.13	115.33	2225	117.25	2241	117.25	2272	111.27
2810	111.27	2817	115.27	2822	115.27	2830	112.77	2897	112.77
2916	122	2954	124	3086	126	3405	126	3669	124
3681	122	3711	112	3782	112	3817	124	4311	126
4672	124	4853	124	4870	118	4891.73	116.03	4921.71	116.1
4941.7	116.61	4961.69	116.04	5001.67	116.88	5051.65	116.96	5061.56	117.82
5081.4	122.54	5111.14	122.22	5135.93	123.38	5155.77	123.52	5185.51	124.56
5205.35	123.48	5235.09	125.62	5259.88	126.36	5314.42	126.83	5334.25	126.66
5349.13	127.73	5359.04	130.14	5378.88	136.27	5388.79	138.37	5408.62	141.4
5438.37	143.99	5458.2	146.12	5497.87	149.27	5522.66	148.34	5542.49	148.98
5577.2	153.93	5597.03	156.24						

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	880	.035	930	.08	2173.15	.035	2225	.055

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
880	930	862.16	963.36	666.85	.1	.3	

Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
2230	2920	115	T				
Right Levee	Station=	2225	Elevation=	117.25			
Blocked Obstructions	num=	1					
Sta L	Sta R	Elev					
3669	5185	124					

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	120.08	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.		0.035
0.057				
W.S. Elev (ft)	120.04	Reach Len. (ft)	862.16	963.36
666.85				

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Crit W.S. (ft) 5313.45	117.26	Flow Area (sq ft)		210.13
E.G. Slope (ft/ft) 7532.76	0.000649	Area (sq ft)		210.13
Q Total (cfs) 8301.55	8893.00	Flow (cfs)		591.45
Top Width (ft) 1866.64	1912.64	Top Width (ft)		46.00
Vel Total (ft/s) 1.56	1.61	Avg. Vel. (ft/s)		2.81
Max Chl Dpth (ft) 2.85	8.77	Hydr. Depth (ft)		4.57
Conv. Total (cfs) 325866.4	349082.8	Conv. (cfs)		23216.5
Length Wtd. (ft) 1871.11	697.85	Wetted Per. (ft)		50.05
Min Ch El (ft) 0.12	112.95	Shear (lb/sq ft)		0.17
Alpha 2225.00	1.08	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 15214.16	0.45	Cum Volume (acre-ft)	9959.87	7773.56
C & E Loss (ft) 3155.02	0.00	Cum SA (acres)	2359.10	695.92

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	121.79	Element	Left OB	Channel
Vel Head (ft) 0.060	0.05	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 666.85	121.74	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 8598.38	117.63	Flow Area (sq ft)	410.54	291.70
E.G. Slope (ft/ft) 10817.69	0.000533	Area (sq ft)	410.54	291.70
Q Total (cfs) 14163.36	15174.00	Flow (cfs)	141.22	869.42
Top Width (ft) 1985.47	2460.40	Top Width (ft)	425.35	49.58
Vel Total (ft/s) 1.65	1.63	Avg. Vel. (ft/s)	0.34	2.98

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Max Chl Dpth (ft) 4.33	10.47	Hydr. Depth (ft)	0.97	5.88
Conv. Total (cfs) 613527.4	657306.3	Conv. (cfs)	6117.4	37661.6
Length Wtd. (ft) 1990.37	711.62	Wetted Per. (ft)	425.65	55.00
Min Ch El (ft) 0.14	112.95	Shear (lb/sq ft)	0.03	0.18
Alpha 2225.00	1.14	Stream Power (lb/ft s)	5597.03	0.00
Frctn Loss (ft) 20791.95	0.60	Cum Volume (acre-ft)	12988.53	10605.80
C & E Loss (ft) 2347.66	0.02	Cum SA (acres)	1607.80	705.80

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	123.18	Element	Left OB	Channel
Vel Head (ft) 0.061	0.08	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 666.85	123.10	Reach Len. (ft)	862.16	963.36
Crit W.S. (ft) 11309.60	118.61	Flow Area (sq ft)	1031.12	359.60
E.G. Slope (ft/ft) 13528.90	0.000720	Area (sq ft)	1031.12	359.60
Q Total (cfs) 24237.20	26361.00	Flow (cfs)	700.84	1422.97
Top Width (ft) 2006.93	2519.57	Top Width (ft)	462.64	50.00
Vel Total (ft/s) 2.14	2.08	Avg. Vel. (ft/s)	0.68	3.96
Max Chl Dpth (ft) 5.64	11.83	Hydr. Depth (ft)	2.23	7.19
Conv. Total (cfs) 903431.6	982595.5	Conv. (cfs)	26123.4	53040.5
Length Wtd. (ft) 2011.92	704.60	Wetted Per. (ft)	463.14	55.53
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.10	0.29

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0.25				
Alpha	1.18	Stream Power (lb/ft s)	5597.03	0.00
2225.00				
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	23410.10	11466.31
32747.26				
C & E Loss (ft)	0.01	Cum SA (acres)	3200.72	705.54
3913.68				

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.95	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.063				
W.S. Elev (ft)	125.88	Reach Len. (ft)	862.16	963.36
666.85				
Crit W.S. (ft)	119.63	Flow Area (sq ft)	2329.92	498.59
19353.53				
E.G. Slope (ft/ft)	0.000501	Area (sq ft)	2329.92	498.59
21572.83				
Q Total (cfs)	41717.00	Flow (cfs)	2245.18	2047.62
37424.20				
Top Width (ft)	4442.62	Top Width (ft)	471.81	50.00
3920.81				
Vel Total (ft/s)	1.88	Avg. Vel. (ft/s)	0.96	4.11
1.93				
Max Chl Dpth (ft)	14.61	Hydr. Depth (ft)	4.94	9.97
4.94				
Conv. Total (cfs)	1863007.0	Conv. (cfs)	100265.9	91442.8
1671298.0				
Length Wtd. (ft)	709.33	Wetted Per. (ft)	472.73	55.53
3925.97				
Min Ch El (ft)	112.95	Shear (lb/sq ft)	0.15	0.28
0.15				
Alpha	1.20	Stream Power (lb/ft s)	5597.03	0.00
2225.00				
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	34159.14	13624.95
46501.74				
C & E Loss (ft)	0.00	Cum SA (acres)	3601.30	707.40
4548.80				

Warning: Divided flow computed for this cross-section.



PatuxentRiver.rep

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 193854.4

INPUT

Description: old section 113 (Laurel study)

Station Elevation Data num= 87

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138	92	136	181	134	271	132	337	130
466	128	603	126	697	124	699.36	123.38	709.36	123.8
739.33	122.42	754.32	120.36	764.31	120.19	809.27	120.22	849.23	120.73
864.22	120.29	899.18	120.26	914.17	120.95	934.15	120.21	974.12	120.23
984.11	119.72	1009.08	120.09	1044.05	119.61	1079.02	119.99	1094.01	119.7
1108.99	118.59	1118.99	119.29	1138.97	119.68	1163.94	119.5	1188.92	118.52
1218.89	118.54	1228.89	119.34	1253.86	118.71	1273.85	118.69	1283.84	119.39
1298.82	119	1308.81	119.37	1328.8	119.18	1338.79	118.7	1383.75	118.57
1393.74	119.23	1403.73	118.55	1433.7	118.29	1453.68	118.49	1463.67	118.21
1488.65	118.45	1503.64	118.03	1523.62	118.46	1538.61	118.11	1598.55	117.93
1648.51	117.93	1688.47	118.8	1708.45	118.15	1733.43	118.89	1757	118.94
1762	114.31	1769	112.35	1781	112.3	1802	114.36	1820	117.25
1848	117.25	1854	115.25	1860	113.25	1866	111.27	2715	111.27
2736	118	2742	120	2756	122	2774	124	2786	126
2968	126	3104	124	3234	124	3368	126	3602	126
3738	124	4039	124	4819	124	4898	122	4916	120
5067	118	5124	120	5148	122	5300	124	5330	126
5412	126	5419	127						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1757	.035	1820	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1757	1820	512.6	496.5	483.9	.1	.3
------	------	-------	-------	-------	----	----

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1830	2750	115	T

Right Levee Station= 1820 Elevation= 117.25

Blocked Obstructions num= 1

Sta L	Sta R	Elev
4819	5300	124

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	119.63	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep				
Vel Head (ft) 0.055	0.06	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	119.56	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 4100.08	117.26	Flow Area (sq ft)	629.93	343.81
E.G. Slope (ft/ft) 7309.60	0.000635	Area (sq ft)	629.93	343.81
Q Total (cfs) 7544.26	8893.00	Flow (cfs)	236.71	1112.03
Top Width (ft) 920.69	1622.91	Top Width (ft)	639.21	63.00
Vel Total (ft/s) 1.84	1.75	Avg. Vel. (ft/s)	0.38	3.23
Max Chl Dpth (ft) 4.45	8.29	Hydr. Depth (ft)	0.99	5.46
Conv. Total (cfs) 299338.6	352853.5	Conv. (cfs)	9392.0	44122.9
Length Wtd. (ft) 922.97	487.01	Wetted Per. (ft)	639.48	65.42
Min Ch El (ft) 0.18	112.30	Shear (lb/sq ft)	0.04	0.21
Alpha 1820.00	1.36	Stream Power (lb/ft s)	5419.00	0.00
Frctn Loss (ft) 15100.55	0.43	Cum Volume (acre-ft)	9953.64	7767.44
C & E Loss (ft) 3133.69	0.01	Cum SA (acres)	2352.78	694.72

Warning: Divided flow computed for this cross-section.  
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	121.17	Element	Left OB	Channel
Vel Head (ft) 0.055	0.22	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 483.90	120.95	Reach Len. (ft)	512.60	496.50
Crit W.S. (ft) 3229.46	118.02	Flow Area (sq ft)	1806.66	430.85
E.G. Slope (ft/ft)	0.001555	Area (sq ft)	1806.66	430.85

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5149.07				
Q Total (cfs)	15174.00	Flow (cfs)	1646.89	2534.81
10992.30				
Top Width (ft)	1624.75	Top Width (ft)	1006.75	63.00
555.00				
Vel Total (ft/s)	2.78	Avg. Vel. (ft/s)	0.91	5.88
3.40				
Max Chl Dpth (ft)	9.68	Hydr. Depth (ft)	1.79	6.84
5.82				
Conv. Total (cfs)	384738.6	Conv. (cfs)	41757.1	64270.5
278711.0				
Length Wtd. (ft)	488.64	Wetted Per. (ft)	1007.13	65.42
565.64				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.17	0.64
0.55				
Alpha	1.85	Stream Power (lb/ft s)	5419.00	0.00
1820.00				
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	12966.59	10597.81
20669.73				
C & E Loss (ft)	0.01	Cum SA (acres)	1593.63	704.55
2328.22				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	122.61	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.15	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	122.46	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	118.12	Flow Area (sq ft)	3338.93	526.19
6790.37				
E.G. Slope (ft/ft)	0.000890	Area (sq ft)	3338.93	526.19
9999.88				
Q Total (cfs)	26361.00	Flow (cfs)	3266.08	2676.21
20418.71				
Top Width (ft)	2021.66	Top Width (ft)	1018.53	63.00
940.14				
Vel Total (ft/s)	2.47	Avg. Vel. (ft/s)	0.98	5.09
3.01				
Max Chl Dpth (ft)	11.19	Hydr. Depth (ft)	3.28	8.35
7.22				
Conv. Total (cfs)	883396.3	Conv. (cfs)	109451.2	89683.8

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684261.3				
Length Wtd. (ft)	489.08	Wetted Per. (ft)	1019.01	65.42
942.65				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.18	0.45
0.40				
Alpha	1.59	Stream Power (lb/ft s)	5419.00	0.00
1820.00				
Frctn Loss (ft)	0.62	Cum Volume (acre-ft)	23366.86	11456.51
32567.16				
C & E Loss (ft)	0.03	Cum SA (acres)	3186.06	704.29
3891.12				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.57	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	125.46	Reach Len. (ft)	512.60	496.50
483.90				
Crit W.S. (ft)	119.23	Flow Area (sq ft)	6536.48	715.26
12352.87				
E.G. Slope (ft/ft)	0.000561	Area (sq ft)	6536.48	715.26
15562.38				
Q Total (cfs)	41717.00	Flow (cfs)	7414.11	3542.16
30760.72				
Top Width (ft)	4164.81	Top Width (ft)	1128.65	63.00
2973.16				
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)	1.13	4.95
2.49				
Max Chl Dpth (ft)	14.19	Hydr. Depth (ft)	5.79	11.35
4.15				
Conv. Total (cfs)	1761808.0	Conv. (cfs)	313115.7	149593.9
1299099.0				
Length Wtd. (ft)	490.11	Wetted Per. (ft)	1129.26	65.42
2975.96				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.20	0.38
0.15				
Alpha	1.52	Stream Power (lb/ft s)	5419.00	0.00
1820.00				
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	34071.40	13611.53

PatuxentRiver.rep

46217.49  
 C & E Loss (ft)                      0.02      Cum SA (acres)                      3585.46      706.15  
 4496.03

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1                                      RS: 193357.9

INPUT

Description:

Station Elevation Data      num=      52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	148	32	138	47	136	97	134	180	132
277	130	374	128	517	126	643	124	745	124.56
839	124	940	124.37	1047	124	1067	120	1105	119.71
1199	120	1288	120	1361	118.9	1424	118	1551	117.85
1663	118	1735	117.7	1840	118	1850	112.6	1900	112.6
1905	117.25	1950	117.25	1985	111.27	2581	111.27	2602	118
2615	120	2632	122	2654	126	2856	126	2973	124
3048	124	3175	126	3508	126	3560	124	3762	124
3931	124	4689	124	4720	122	4738	120	4818	118
4862	120	4968	122	5101	122	5132	124	5228	124
5247	126	5267	128						

Manning's n Values      num=      4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1840	.03	1905	.03	1950	.055

Bank Sta: Left      Right      Lengths: Left Channel      Right      Coeff Contr.      Expan.  
                  1840      1905                      178.5      181.3      183.7                      .1                      .3

Ineffective Flow      num=      1  
 Sta L      Sta R      Elev      Permanent  
 1940      5267      115      T  
 Right Levee      Station=      1950      Elevation=      117.25

Blocked Obstructions      num=      1  
 Sta L      Sta R      Elev  
 4689      5132      124

CROSS SECTION OUTPUT      Profile #10yr

E.G. Elev (ft)                      119.19      Element                      Left OB      Channel

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Right OB				
Vel Head (ft)	0.19	Wt. n-Val.	0.100	0.030
0.054				
W.S. Elev (ft)	119.00	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	117.26	Flow Area (sq ft)	495.95	377.44
2661.86				
E.G. Slope (ft/ft)	0.001318	Area (sq ft)	495.95	377.44
4947.36				
Q Total (cfs)	8893.00	Flow (cfs)	271.32	2123.95
6497.73				
Top Width (ft)	1254.21	Top Width (ft)	485.70	65.00
703.51				
Vel Total (ft/s)	2.52	Avg. Vel. (ft/s)	0.55	5.63
2.44				
Max Chl Dpth (ft)	7.73	Hydr. Depth (ft)	1.02	5.81
3.78				
Conv. Total (cfs)	244925.6	Conv. (cfs)	7472.6	58496.5
178956.5				
Length Wtd. (ft)	183.14	Wetted Per. (ft)	485.71	68.19
705.14				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.08	0.46
0.31				
Alpha	1.88	Stream Power (lb/ft s)	5267.00	0.00
1950.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	9947.01	7763.33
15032.47				
C & E Loss (ft)	0.05	Cum SA (acres)	2346.16	693.99
3124.66				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.37	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.29	Wt. n-Val.	0.100	0.030
0.054				
W.S. Elev (ft)	120.08	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	117.99	Flow Area (sq ft)	1098.12	447.81
3427.34				
E.G. Slope (ft/ft)	0.001684	Area (sq ft)	1098.12	447.81

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5712.84				
Q Total (cfs)	15174.00	Flow (cfs)	845.84	3191.87
11136.29				
Top Width (ft)	1549.13	Top Width (ft)	773.42	65.00
710.71				
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)	0.77	7.13
3.25				
Max Chl Dpth (ft)	8.81	Hydr. Depth (ft)	1.42	6.89
4.82				
Conv. Total (cfs)	369771.1	Conv. (cfs)	20612.2	77781.7
271377.3				
Length Wtd. (ft)	183.07	Wetted Per. (ft)	773.44	68.19
712.43				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.15	0.69
0.51				
Alpha	1.98	Stream Power (lb/ft s)	5267.00	0.00
1950.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	12949.50	10592.80
20609.40				
C & E Loss (ft)	0.07	Cum SA (acres)	1583.15	703.82
2321.19				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.	0.100	0.030
0.053				
W.S. Elev (ft)	121.56	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	119.12	Flow Area (sq ft)	2243.53	543.62
4484.12				
E.G. Slope (ft/ft)	0.001956	Area (sq ft)	2243.53	543.62
6769.63				
Q Total (cfs)	26361.00	Flow (cfs)	2979.81	4752.64
18628.55				
Top Width (ft)	1569.03	Top Width (ft)	780.79	65.00
723.24				
Vel Total (ft/s)	3.63	Avg. Vel. (ft/s)	1.33	8.74
4.15				
Max Chl Dpth (ft)	10.29	Hydr. Depth (ft)	2.87	8.36

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6.20				
Conv. Total (cfs)	595985.3	Conv. (cfs)	67369.4	107450.5
421165.4				
Length Wtd. (ft)	182.89	Wetted Per. (ft)	780.96	68.19
725.04				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.35	0.97
0.76				
Alpha	1.99	Stream Power (lb/ft s)	5267.00	0.00
1950.00				
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	23334.01	11450.41
32474.02				
C & E Loss (ft)	0.10	Cum SA (acres)	3175.47	703.56
3881.88				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	125.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.030
0.053				
W.S. Elev (ft)	124.91	Reach Len. (ft)	178.50	181.30
183.70				
Crit W.S. (ft)	120.00	Flow Area (sq ft)	5187.26	761.52
8594.78				
E.G. Slope (ft/ft)	0.001046	Area (sq ft)	5187.26	761.52
10880.29				
Q Total (cfs)	41717.00	Flow (cfs)	6421.34	6094.69
29200.97				
Top Width (ft)	3948.63	Top Width (ft)	1254.32	65.00
2629.31				
Vel Total (ft/s)	2.87	Avg. Vel. (ft/s)	1.24	8.00
3.40				
Max Chl Dpth (ft)	13.64	Hydr. Depth (ft)	4.14	11.72
3.27				
Conv. Total (cfs)	1289858.0	Conv. (cfs)	198543.0	188443.3
902872.0				
Length Wtd. (ft)	182.68	Wetted Per. (ft)	1254.75	68.19
2631.48				
Min Ch El (ft)	112.60	Shear (lb/sq ft)	0.27	0.73
0.21				
Alpha	2.15	Stream Power (lb/ft s)	5267.00	0.00



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1950.00  
 Frctn Loss (ft) 0.10 Cum Volume (acre-ft) 34002.42 13603.11  
 46070.62  
 C & E Loss (ft) 0.07 Cum SA (acres) 3571.44 705.42  
 4464.91

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
 This may indicate the need for additional cross sections.  
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1 RS: 193176.6

INPUT

Description: old section 112.5 (Laurel study)

Station Elevation Data		num= 126							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	146.75	112	146	235	144	264	142	279	140
290	138	300	136	309	134	315	132	322	130
334	128	337.57	127.93	367.35	126.31	387.21	126.98	441.82	125.28
461.77	124.23	501.72	124.18	561.65	123.02	571.63	122.47	601.6	122.56
661.53	121.87	676.51	122.15	696.49	121.88	726.45	122.76	746.43	122.24
761.41	122.69	781.39	120.89	791.37	122.25	816.34	121.36	851.3	122.07
866.29	121.75	911.23	118.89	936.2	118.92	956.18	118.41	1031.09	118.42
1041.08	118.84	1071.04	118.7	1081.03	119.27	1110.99	118.78	1145.95	118.88
1175.92	119.72	1215.87	120.16	1235.84	119.28	1260.81	119.56	1290.78	118.95
1315.75	119.76	1335.72	118.88	1345.71	119.27	1385.67	118.35	1395.65	118.62
1430.61	118.25	1460.58	118.59	1480.55	118.06	1505.52	118.1	1520.5	117.66
1570.44	117.22	1595.41	117.78	1610.4	117.02	1635.37	117.3	1645.35	116.69
1675.32	117.59	1690.3	116.82	1710.28	116.77	1725.26	117.56	1760.22	116.41
1770.2	116.4	1790.18	117.47	1820	117.2	1824	112.5	1850	112.3
1876	112.5	1880	117.25	1925	117.25	1925	110.27	3508	110.27
3548	122	3573	124	3802	124	3834	122	3907	120
3927.11	119.46	3952.07	120.58	3982.03	121.01	3992.01	120.66	4002	118.94
4016.98	120.45	4061.91	119.32	4146.79	120.49	4166.76	120.33	4186.73	121.14
4231.66	121.14	4251.63	120.83	4306.55	121.06	4341.5	120.85	4366.46	120.05
4421.38	119.82	4446.35	121.46	4506.26	122.52	4571.16	120.64	4596.13	122.86
4616.1	123.87	4656.04	124.39	4666.02	124.21	4690.97	122.17	4700.91	122.22
4715.83	123.72	4750.65	124.86	4765.57	124.29	4780.48	122.94	4800.38	123.75
4835.19	124.2	4855.08	126.17	4870	125.12	4879.95	125.85	4899.84	125.73

PatuxentRiver.rep

4934.65 126.69 4949.57 125.9 4964.49 126.01 4989.36 128.45 5024.17 130.54  
 5058.98 131.03 5118.66 135.64 5168.39 140.34 5193.26 141.03 5252.93 145.46  
 5282.77 146.72

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1820 .035 1925 .055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1820 1880 299.2 309.6 325.3 .1 .3

Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 1915 3535 115 T  
 Right Levee Station= 1900 Elevation= 117.25  
 Blocked Obstructions num= 1  
 Sta L Sta R Elev  
 3805 4690 122

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	119.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	119.01	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)	117.25	Flow Area (sq ft)	728.94	376.74
6514.62				
E.G. Slope (ft/ft)	0.000309	Area (sq ft)	728.94	376.74
14040.36				
Q Total (cfs)	8893.00	Flow (cfs)	225.41	913.58
7754.01				
Top Width (ft)	2411.84	Top Width (ft)	694.04	60.00
1657.80				
Vel Total (ft/s)	1.17	Avg. Vel. (ft/s)	0.31	2.42
1.19				
Max Chl Dpth (ft)	8.74	Hydr. Depth (ft)	1.05	6.28
3.93				
Conv. Total (cfs)	505566.9	Conv. (cfs)	12814.7	51936.8
440815.3				
Length Wtd. (ft)	323.08	Wetted Per. (ft)	694.26	64.38
1666.03				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.02	0.11
0.08				
Alpha	1.35	Stream Power (lb/ft s)	5282.77	0.00
1900.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	9944.50	7761.76

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14992.43  
 C & E Loss (ft) 0.00 Cum SA (acres) 2343.74 693.73  
 3119.69

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.17	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	120.12	Reach Len. (ft)	299.20	309.60
325.30				
Crit W.S. (ft)	117.26	Flow Area (sq ft)	1655.93	443.66
8365.96				
E.G. Slope (ft/ft)	0.000385	Area (sq ft)	1655.93	443.66
15891.70				
Q Total (cfs)	15174.00	Flow (cfs)	737.61	1338.02
13098.38				
Top Width (ft)	2645.51	Top Width (ft)	923.91	60.00
1661.60				
Vel Total (ft/s)	1.45	Avg. Vel. (ft/s)	0.45	3.02
1.57				
Max Chl Dpth (ft)	9.85	Hydr. Depth (ft)	1.79	7.39
5.03				
Conv. Total (cfs)	773527.4	Conv. (cfs)	37601.1	68208.4
667717.9				
Length Wtd. (ft)	322.38	Wetted Per. (ft)	924.25	64.38
1669.99				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.04	0.17
0.12				
Alpha	1.39	Stream Power (lb/ft s)	5282.77	0.00
1900.00				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	12943.85	10590.95
20563.84				
C & E Loss (ft)	0.00	Cum SA (acres)	1579.68	703.56
2316.19				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100yr

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E.G. Elev (ft) Right OB	121.71	Element	Left OB	Channel
Vel Head (ft) 0.055	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 325.30	121.64	Reach Len. (ft)	299.20	309.60
Crit W.S. (ft) 10887.99	117.32	Flow Area (sq ft)	3088.63	534.59
E.G. Slope (ft/ft) 18413.73	0.000461	Area (sq ft)	3088.63	534.59
Q Total (cfs) 22211.39	26361.00	Flow (cfs)	2151.05	1998.56
Top Width (ft) 1666.77	2714.02	Top Width (ft)	987.26	60.00
Vel Total (ft/s) 2.04	1.82	Avg. Vel. (ft/s)	0.70	3.74
Max Chl Dpth (ft) 6.53	11.37	Hydr. Depth (ft)	3.13	8.91
Conv. Total (cfs) 1034295.0	1227526.0	Conv. (cfs)	100165.8	93064.8
Length Wtd. (ft) 1675.38	321.67	Wetted Per. (ft)	987.73	64.38
Min Ch El (ft) 0.19	112.30	Shear (lb/sq ft)	0.09	0.24
Alpha 1900.00	1.40	Stream Power (lb/ft s)	5282.77	0.00
Frctn Loss (ft) 32420.92	0.15	Cum Volume (acre-ft)	23323.09	11448.17
C & E Loss (ft) 3876.84	0.00	Cum SA (acres)	3171.85	703.30

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	125.02	Element	Left OB	Channel
Vel Head (ft) 0.054	0.05	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 325.30	124.97	Reach Len. (ft)	299.20	309.60
Crit W.S. (ft) 19310.07	118.02	Flow Area (sq ft)	7237.65	734.29
E.G. Slope (ft/ft)	0.000323	Area (sq ft)	7237.65	734.29

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26835.81									
Q Total (cfs)	41717.00	Flow (cfs)	5853.51	2838.18					
33025.31									
Top Width (ft)	4395.15	Top Width (ft)	1372.22	60.00					
2962.93									
Vel Total (ft/s)	1.53	Avg. Vel. (ft/s)	0.81	3.87					
1.71									
Max Chl Dpth (ft)	14.70	Hydr. Depth (ft)	5.27	12.24					
6.52									
Conv. Total (cfs)	2321650.0	Conv. (cfs)	325761.7	157951.5					
1837937.0									
Length Wtd. (ft)	320.41	Wetted Per. (ft)	1372.90	64.38					
2972.12									
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.11	0.23					
0.13									
Alpha	1.46	Stream Power (lb/ft s)	5282.77	0.00					
1900.00									
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	33976.96	13600.00					
45991.09									
C & E Loss (ft)	0.00	Cum SA (acres)	3566.06	705.16					
4453.12									

CROSS SECTION

RIVER: Patuxent River  
 REACH: 1

RS: 192867

INPUT

Description:

Station Elevation Data	num=	67							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
0 146	171 144	209 142	223 140	231 138					
239 136	244 134	250 132	255 130	267 128					
343 126	437 124	562 122	719 120	729 118					
749 118.26	783 118	836 118	887 117.89	965 118					
1138 118.26	1276 118.34	1331 118	1433 118	1510 117.64					
1608 117.32	1669 116.64	1704 116	1747 118	1794 118.16					
1824 117.86	1828 114.62	1857 112.3	1886 114.82	1895 120.23					
1902 122.02	1916 122.61	2019 120	2062 116	2100 111					
2521 111	2921 111.75	2945 112	2970 114	3234 114					
3328 111	3752 111	3768 116	3787 119.58	3908 119.69					
3969 119.94	3991 120	4070 122	4145 122.26	4215 122					
4379 122	4573 124	4766 126	4836 128	4965 130					
4986 132	5010 134	5028 136	5046 138	5056 140					
5068 142	5084 143								

PatuxentRiver.rep

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .1 1824 .035 1916 .055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 1824 1916 93 92.3 92 .1 .3  
 Ineffective Flow num= 1  
 Sta L Sta R Elev Permanent  
 1916 5084 115 T

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.93	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	118.91	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	1150.09	337.79
6732.97				
E.G. Slope (ft/ft)	0.000311	Area (sq ft)	1150.09	337.79
12273.37				
Q Total (cfs)	8893.00	Flow (cfs)	310.71	713.92
7868.38				
Top Width (ft)	2921.08	Top Width (ft)	1099.55	68.80
1752.73				
Vel Total (ft/s)	1.08	Avg. Vel. (ft/s)	0.27	2.11
1.17				
Max Chl Dpth (ft)	7.91	Hydr. Depth (ft)	1.05	4.91
3.84				
Conv. Total (cfs)	503959.8	Conv. (cfs)	17607.5	40457.3
445895.0				
Length Wtd. (ft)	92.12	Wetted Per. (ft)	1099.70	71.29
1754.35				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.02	0.09
0.07				
Alpha	1.34	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	9938.05	7759.22
14894.17				
C & E Loss (ft)	0.01	Cum SA (acres)	2337.58	693.27
3106.95				

Warning: Divided flow computed for this cross-section.

PatuxentRiver.rep

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	120.04	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.035
0.055				
W.S. Elev (ft)	120.00	Reach Len. (ft)	93.00	92.30
92.00				
Crit W.S. (ft)		Flow Area (sq ft)	2351.22	413.75
8707.99				
E.G. Slope (ft/ft)	0.000413	Area (sq ft)	2351.22	413.75
14248.39				
Q Total (cfs)	15174.00	Flow (cfs)	1174.96	1131.19
12867.85				
Top Width (ft)	3147.48	Top Width (ft)	1105.00	70.62
1971.87				
Vel Total (ft/s)	1.32	Avg. Vel. (ft/s)	0.50	2.73
1.48				
Max Chl Dpth (ft)	9.00	Hydr. Depth (ft)	2.13	5.86
4.42				
Conv. Total (cfs)	746305.4	Conv. (cfs)	57788.4	55635.6
632881.4				
Length Wtd. (ft)	92.16	Wetted Per. (ft)	1105.26	73.40
1973.61				
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.05	0.15
0.11				
Alpha	1.39	Stream Power (lb/ft s)	5084.00	0.00
0.00				
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	12930.09	10587.90
20451.30				
C & E Loss (ft)	0.01	Cum SA (acres)	1572.71	703.10
2302.62				

Warning: Divided flow computed for this cross-section.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

PatuxentRiver.rep				
E.G. Elev (ft) Right OB	121.56	Element	Left OB	Channel
Vel Head (ft) 0.055	0.06	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	121.50	Reach Len. (ft)	93.00	92.30
Crit W.S. (ft) 11756.23		Flow Area (sq ft)	4097.84	523.41
E.G. Slope (ft/ft) 17296.63	0.000468	Area (sq ft)	4097.84	523.41
Q Total (cfs) 21715.62	26361.00	Flow (cfs)	2949.35	1696.03
Top Width (ft) 2090.47	3389.22	Top Width (ft)	1222.78	75.97
Vel Total (ft/s) 1.85	1.61	Avg. Vel. (ft/s)	0.72	3.24
Max Chl Dpth (ft) 5.62	10.50	Hydr. Depth (ft)	3.35	6.89
Conv. Total (cfs) 1003854.0	1218597.0	Conv. (cfs)	136340.3	78402.9
Length Wtd. (ft) 2092.25	92.19	Wetted Per. (ft)	1223.05	78.98
Min Ch El (ft) 0.16	112.30	Shear (lb/sq ft)	0.10	0.19
Alpha 0.00	1.37	Stream Power (lb/ft s)	5084.00	0.00
Frctn Loss (ft) 32287.58	0.07	Cum Volume (acre-ft)	23298.40	11444.41
C & E Loss (ft) 3862.82	0.01	Cum SA (acres)	3164.26	702.81

Warning: Divided flow computed for this cross-section.  
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.  
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.93	Element	Left OB	Channel
Vel Head (ft) 0.055	0.04	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 92.00	124.89	Reach Len. (ft)	93.00	92.30
Crit W.S. (ft)		Flow Area (sq ft)	8614.38	822.93



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20295.33					
E.G. Slope (ft/ft)	0.000247	Area (sq ft)	8614.38	822.93	
25835.73					
Q Total (cfs)	41717.00	Flow (cfs)	6668.14	2316.08	
32732.78					
Top Width (ft)	4263.08	Top Width (ft)	1428.62	92.00	
2742.46					
Vel Total (ft/s)	1.40	Avg. Vel. (ft/s)	0.77	2.81	
1.61					
Max Chl Dpth (ft)	13.89	Hydr. Depth (ft)	6.03	8.94	
7.40					
Conv. Total (cfs)	2652595.0	Conv. (cfs)	423996.9	147268.8	
2081329.0					
Length Wtd. (ft)	92.23	Wetted Per. (ft)	1428.92	95.09	
2744.28					
Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.09	0.13	
0.11					
Alpha	1.31	Stream Power (lb/ft s)	5084.00	0.00	
0.00					
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	33922.52	13594.47	
45794.42					
C & E Loss (ft)	0.00	Cum SA (acres)	3556.44	704.62	
4431.82					

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 192774.7

INPUT

Description:

Station Elevation Data	num=	60							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	145	134	144	193	142	237	130	249	128
351	126	434	124	559	122	715	120	738	118
962	117.77	1075	118.79	1176	118.19	1386	118	1603	116
1621	116	1710	116.5	1775	117.1	1807	118	1827	118.8
1855	118	1870	112.35	1922	112.35	1924	118	2005	117
2087	117.8	2104	118	2165	117.2	2269	116.3	2446	116.8
2480	116	2554	116.4	2591	116	2656	116	2699	113.6
2712	113.6	2752	114	2755	116.9	2775	112.52	2792	111.8

PatuxentRiver.rep

2800	112.39	2816	114	2843	114.4	2860	114	2974	115.1
3113	115.2	3160	115.6	3260	116	3270	117.1	3367	117.1
3625	117.3	3692	119	3717	118	3802	118.7	3834	120
3853	120.8	4191	122	4463	124	4637	126	4984	127

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1855	.035	1924	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	1855	1924		261.34	259.8	275.16	.1	.3
Ineffective Flow	num=		1					
Sta L	Sta R	Elev	Permanent					
2600	4984	115	T					

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.87	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.14	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	118.73	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	1223.62	392.06
4173.27				
E.G. Slope (ft/ft)	0.001846	Area (sq ft)	1223.62	392.06
4470.75				
Q Total (cfs)	8893.00	Flow (cfs)	871.11	2173.14
5848.75				
Top Width (ft)	3033.94	Top Width (ft)	1103.77	69.00
1861.18				
Vel Total (ft/s)	1.54	Avg. Vel. (ft/s)	0.71	5.54
1.40				
Max Chl Dpth (ft)	6.93	Hydr. Depth (ft)	1.11	5.68
2.24				
Conv. Total (cfs)	206968.3	Conv. (cfs)	20273.5	50575.8
136119.0				
Length Wtd. (ft)	269.86	Wetted Per. (ft)	1103.86	74.02
1863.15				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.13	0.61
0.26				
Alpha	3.75	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	9935.52	7758.45
14876.49				
C & E Loss (ft)	0.00	Cum SA (acres)	2335.23	693.13
3103.13				

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.96	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.100	0.035
0.080				
W.S. Elev (ft)	119.85	Reach Len. (ft)	261.34	259.80
275.16				
Crit W.S. (ft)		Flow Area (sq ft)	2489.71	469.29
6289.04				
E.G. Slope (ft/ft)	0.001519	Area (sq ft)	2489.71	469.29
6586.52				
Q Total (cfs)	15174.00	Flow (cfs)	2429.74	2660.30
10083.96				
Top Width (ft)	3113.49	Top Width (ft)	1138.24	69.00
1906.24				
Vel Total (ft/s)	1.64	Avg. Vel. (ft/s)	0.98	5.67
1.60				
Max Chl Dpth (ft)	8.05	Hydr. Depth (ft)	2.19	6.80
3.30				
Conv. Total (cfs)	389276.0	Conv. (cfs)	62332.8	68247.7
258695.5				
Length Wtd. (ft)	270.01	Wetted Per. (ft)	1138.39	74.02
1908.25				
Min Ch El (ft)	112.35	Shear (lb/sq ft)	0.21	0.60
0.31				
Alpha	2.78	Stream Power (lb/ft s)	4984.00	0.00
0.00				
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	12924.92	10586.96
20429.30				
C & E Loss (ft)	0.00	Cum SA (acres)	1570.31	702.95
2298.52				

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	121.48	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.100	0.035
0.080				

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W.S. Elev (ft) 275.16	121.36	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 9231.55		Flow Area (sq ft)	4280.89	573.37
E.G. Slope (ft/ft) 9529.02	0.001410	Area (sq ft)	4280.89	573.37
Q Total (cfs) 17344.69	26361.00	Flow (cfs)	5438.26	3578.04
Top Width (ft) 2085.54	3400.29	Top Width (ft)	1245.75	69.00
Vel Total (ft/s) 1.88	1.87	Avg. Vel. (ft/s)	1.27	6.24
Max Chl Dpth (ft) 4.43	9.56	Hydr. Depth (ft)	3.44	8.31
Conv. Total (cfs) 461957.1	702096.6	Conv. (cfs)	144842.2	95297.3
Length Wtd. (ft) 2087.57	269.89	Wetted Per. (ft)	1245.91	74.02
Min Ch El (ft) 0.39	112.35	Shear (lb/sq ft)	0.30	0.68
Alpha 0.00	2.27	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 32259.25	0.41	Cum Volume (acre-ft)	23289.46	11443.25
C & E Loss (ft) 3858.41	0.00	Cum SA (acres)	3161.62	702.66

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.89	Element	Left OB	Channel
Vel Head (ft) 0.080	0.07	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 275.16	124.83	Reach Len. (ft)	261.34	259.80
Crit W.S. (ft) 17564.25		Flow Area (sq ft)	9003.30	812.76
E.G. Slope (ft/ft) 17861.72	0.000547	Area (sq ft)	9003.30	812.76
Q Total (cfs) 27183.29	41717.00	Flow (cfs)	10546.11	3987.60
Top Width (ft) 2610.79	4135.03	Top Width (ft)	1455.24	69.00
Vel Total (ft/s) 1.55	1.52	Avg. Vel. (ft/s)	1.17	4.91

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Max Chl Dpth (ft) 6.73	13.03	Hydr. Depth (ft)	6.19	11.78
Conv. Total (cfs) 1162019.0	1783300.0	Conv. (cfs)	450820.4	170460.1
Length Wtd. (ft) 2612.83	269.88	Wetted Per. (ft)	1455.43	74.02
Min Ch El (ft) 0.23	112.35	Shear (lb/sq ft)	0.21	0.38
Alpha 0.00	1.81	Stream Power (lb/ft s)	4984.00	0.00
Frctn Loss (ft) 45748.27	0.15	Cum Volume (acre-ft)	33903.71	13592.73
C & E Loss (ft) 4426.16	0.00	Cum SA (acres)	3553.36	704.45

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 192514.9

INPUT

Description: old section 112 (Laurel study)

Station Elevation Data		num= 190							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	139	65	138	142	136	163	134	170	132
177	130	204	128	319	126	399	124	526	122
684	120	705	118	707.59	117.54	742.56	117.03	762.54	118.1
802.51	117.21	832.49	118.36	857.47	117.42	997.35	117.29	1052.31	118.31
1147.23	117.82	1157.22	118.6	1187.19	117.69	1212.17	118.69	1222.17	117.85
1247.14	118.34	1287.11	118.23	1302.1	117.01	1327.08	117.48	1337.07	116.52
1362.05	117.51	1431.99	116.62	1461.97	116.62	1481.95	117.38	1506.93	116.21
1571.87	116.11	1591.86	115.72	1691.77	115.69	1711.76	116.49	1746.73	116.12
1776.7	117.11	1801.68	116.6	1846.65	116.61	1881.62	117.31	1901.6	118.29
1945	115.4	1949	112.7	1976	112.4	2004	112.7	2008	115.4
2041.51	118.09	2071.5	117.1	2116.49	117.82	2146.49	116.41	2211.47	116.67
2221.47	116.13	2291.46	116.27	2336.45	116.01	2361.44	116.87	2381.44	116.43
2391.44	113.98	2411.43	116.67	2436.43	116.01	2456.43	116.27	2466.42	115.19
2566.4	115.56	2611.4	115.26	2621.39	115.92	2646.39	115.09	2706.38	114.72
2726.37	115.04	2746.37	114.17	2756.37	112.1	2776.36	114.74	2791.36	115.55
2806.36	113.73	2846.35	115.38	2956.33	114.19	3021.32	114.21	3066.31	114.15
3131.29	114.62	3206.28	114.19	3271.27	114.87	3296.26	114.76	3321.26	115.87
3331.25	115.16	3406.24	117.36	3426.24	116.85	3446.23	119.97	3461.23	116.5
3471.23	115.96	3501.22	116.4	3561.21	118.51	3596.2	118.71	3676.19	118.04
3696.18	117.21	3721.18	118.76	3731.18	117.97	3761.17	119.47	3806.16	118.94
3831.16	119.56	3861.15	117.97	3881.15	118.66	3906.14	117.57	3936.14	118.4

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3956.13	118.07	3966.13	119.13	3976.13	117.79	3986.13	118.5	4036.12	118.05
4051.11	119.44	4061.11	117.9	4071.11	119.08	4086.11	118.43	4096.11	119.6
4111.1	118.44	4121.1	119.37	4146.1	118.37	4176.09	118.88	4231.08	122.1
4236.08	121.85	4271.07	123.99	4291.07	120.83	4311.06	121.73	4346.06	121.3
4361.05	120.43	4426.04	120.66	4441.04	119.54	4466.03	121.43	4486.03	120.49
4506.03	122.15	4531.02	121.87	4551.02	118.67	4576.01	117.96	4596.01	119.11
4611	118.42	4631	122.24	4665.99	121.95	4690.99	122.87	4705.99	122.25
4715.98	123.69	4725.98	121.32	4765.97	121.73	4780.97	122.9	4790.97	122.16
4810.97	122.84	4885.95	122.86	4945.94	124.68	4970.93	124.31	4990.93	125.76
5000.93	124.44	5020.92	126.77	5035.92	124.7	5080.91	126.06	5090.91	127.46
5105.91	126.19	5130.9	125.78	5165.9	123.64	5195.89	124.26	5210.89	122.4
5230.88	125.89	5250.88	125.71	5260.88	124.46	5270.88	127.18	5295.87	128.91
5340.86	129.11	5350.86	130.4	5375.86	129.38	5405.85	130.62	5420.85	130.54
5495.83	132.49	5560.82	133	5590.81	131.67	5605.81	132.35	5635.8	136.11
5700.79	137.58	5745.78	136.95	5760.78	136.17	5870.76	139.47	5900.75	139.37
5925.75	140.04	5940.75	139.54	5970.74	140.29	5995.73	139.44	6015.73	140.03
6055.72	140.11	6080.72	139.06	6110.71	140.59	6150.7	139.42	6170.7	141.7

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1	1945 .035	2008 .1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1945	2008	640.52	833.38	848.74	.1	.3	
Ineffective Flow	num=	1					
Sta L	Sta R	Elev	Permanent				
4100	6170.7	130	F				

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	118.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.18	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	118.10	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	116.87	Flow Area (sq ft)	1199.73	337.34
3937.69				
E.G. Slope (ft/ft)	0.002582	Area (sq ft)	1199.73	337.34
3938.17				
Q Total (cfs)	8893.00	Flow (cfs)	1100.68	2189.36
5602.96				
Top Width (ft)	2757.59	Top Width (ft)	1067.50	63.00
1627.09				
Vel Total (ft/s)	1.62	Avg. Vel. (ft/s)	0.92	6.49
1.42				
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)	1.12	5.35

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2.43				
Conv. Total (cfs)	175001.1	Conv. (cfs)	21659.7	43083.4
110258.0				
Length Wtd. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66
1621.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84
0.39				
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27
14849.93				
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73
3092.12				

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	119.47	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.17	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	119.31	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	117.77	Flow Area (sq ft)	2372.94	413.67
5659.80				
E.G. Slope (ft/ft)	0.002169	Area (sq ft)	2372.94	413.67
5659.80				
Q Total (cfs)	15174.00	Flow (cfs)	2797.08	2818.73
9558.20				
Top Width (ft)	2612.88	Top Width (ft)	1065.00	63.00
1484.88				
Vel Total (ft/s)	1.80	Avg. Vel. (ft/s)	1.18	6.81
1.69				
Max Chl Dpth (ft)	7.21	Hydr. Depth (ft)	2.23	6.57
3.81				
Conv. Total (cfs)	325833.7	Conv. (cfs)	60062.0	60526.9
205244.7				
Length Wtd. (ft)	796.36	Wetted Per. (ft)	1067.36	64.66
1489.79				

PatuxentRiver.rep				
Min Ch El (ft) 0.51	112.40	Shear (lb/sq ft)	0.30	0.87
Alpha 0.00	3.31	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft) 20390.62	1.29	Cum Volume (acre-ft)	12910.34	10584.33
C & E Loss (ft) 2287.81	0.03	Cum SA (acres)	1563.70	702.56

Warning: Divided flow computed for this cross-section.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	121.07	Element	Left OB	Channel
Vel Head (ft) 0.100	0.13	Wt. n-Val.	0.100	0.035
W.S. Elev (ft) 848.74	120.93	Reach Len. (ft)	640.52	833.38
Crit W.S. (ft) 9607.66	118.59	Flow Area (sq ft)	4760.94	515.99
E.G. Slope (ft/ft) 10041.48	0.001662	Area (sq ft)	4760.94	515.99
Q Total (cfs) 16064.12	26361.00	Flow (cfs)	6730.67	3566.21
Top Width (ft) 2414.95	3812.49	Top Width (ft)	1334.54	63.00
Vel Total (ft/s) 1.67	1.77	Avg. Vel. (ft/s)	1.41	6.91
Max Chl Dpth (ft) 4.59	8.83	Hydr. Depth (ft)	3.57	8.19
Conv. Total (cfs) 394077.0	646675.1	Conv. (cfs)	165113.5	87484.6
Length Wtd. (ft) 2094.91	785.60	Wetted Per. (ft)	1335.21	64.66
Min Ch El (ft) 0.48	112.40	Shear (lb/sq ft)	0.37	0.83
Alpha 0.00	2.77	Stream Power (lb/ft s)	6170.70	0.00
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	23262.34	11440.00



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32197.44  
 C & E Loss (ft) 0.03 Cum SA (acres) 3153.88 702.27  
 3844.19

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft)	124.74	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.035
0.100				
W.S. Elev (ft)	124.68	Reach Len. (ft)	640.52	833.38
848.74				
Crit W.S. (ft)	119.34	Flow Area (sq ft)	10251.38	751.91
17441.49				
E.G. Slope (ft/ft)	0.000562	Area (sq ft)	10251.38	751.91
20378.10				
Q Total (cfs)	41717.00	Flow (cfs)	12595.10	3884.37
25237.53				
Top Width (ft)	4684.82	Top Width (ft)	1573.02	63.00
3048.80				
Vel Total (ft/s)	1.47	Avg. Vel. (ft/s)	1.23	5.17
1.45				
Max Chl Dpth (ft)	12.58	Hydr. Depth (ft)	6.52	11.94
8.34				
Conv. Total (cfs)	1759776.0	Conv. (cfs)	531307.3	163857.0
1064611.0				
Length Wtd. (ft)	780.73	Wetted Per. (ft)	1573.73	64.66
2094.91				
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.23	0.41
0.29				
Alpha	1.96	Stream Power (lb/ft s)	6170.70	0.00
0.00				
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	33845.96	13588.07
45627.50				
C & E Loss (ft)	0.01	Cum SA (acres)	3544.27	704.06
4408.29				

PatuxentRiver.rep

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 191681.5

INPUT

Description: CF - old section 111 (Laurel study)

Station Elevation Data		num= 175							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	137	38	136	66	134	94	132	222	130
316	128	388	126	513	124	593	122	615	120
631	116	639.6	114.52	649.59	113.86	664.58	114.28	694.56	114.09
709.56	114.44	729.54	114.14	779.51	114.07	794.5	114.49	809.49	114.05
824.48	114.69	854.47	114.64	869.46	114.09	909.43	113.69	934.42	114.32
954.4	113.69	1009.37	114.18	1019.36	113.56	1044.35	114.12	1064.33	113.71
1089.32	114.32	1114.3	114.52	1139.29	113.75	1174.26	113.53	1199.25	114.37
1224.23	114.26	1239.22	113.66	1284.19	114.03	1299.18	114.88	1314.18	114.99
1339.16	114.13	1349.15	114.64	1369.14	114.48	1379.13	113.96	1429.1	113.99
1444.09	114.89	1454.09	114.24	1469.08	114.06	1489.06	114.43	1509.05	114
1544.03	114.09	1584	113.99	1603.99	114.57	1623.98	114.01	1638.97	114.78
1648.96	114.46	1673.95	114.92	1693.93	114.46	1703.93	114.57	1723.92	115.76
1753.9	114.88	1768.89	114.99	1778.88	115.65	1803.86	115.37	1843	115.91
1847	112.33	1864	112.63	1882	113.94	1884	115.95	1888.81	115.86
1903.8	116.14	1918.79	114.96	1933.78	115.22	1943.78	115.89	1968.76	115.01
1978.75	115.03	2003.73	114.32	2033.71	114.1	2053.69	115.39	2068.68	115.07
2088.66	114.08	2148.61	114.11	2168.59	114.52	2178.59	114.08	2198.57	114.24
2208.56	115.06	2228.54	114.11	2258.52	114.5	2298.49	114.41	2308.48	114.78
2338.45	114.52	2348.45	114.8	2363.43	113.93	2513.31	113.86	2533.29	114.08
2543.28	113.65	2578.25	113.7	2613.23	113.41	2623.22	113.11	2643.2	113.54
2658.19	113.07	2683.17	113.36	2693.16	113.09	2733.13	113.26	2793.08	113.1
2818.05	113.59	2833.04	113.19	2858.02	113.36	2878.01	113.89	2892.99	113.32
2932.96	113.8	2942.95	113.35	2962.93	113.3	2972.93	113.77	2987.91	113.5
3007.9	113.9	3027.88	113.27	3042.87	113.86	3052.86	113.19	3062.85	113.85
3072.84	113.5	3087.83	114.66	3107.81	112.97	3122.8	113.55	3142.79	113.42
3157.77	114.27	3172.76	112.6	3182.75	112.63	3187.75	110.55	3192.74	106.57
3197.74	111.22	3202.74	113.79	3217.72	112.89	3247.7	114.12	3267.68	112.95
3287.66	113.27	3307.65	112.78	3342.62	113.36	3352.61	112.81	3372.59	112.4
3382.59	113.04	3397.57	112.63	3402.57	111.7	3417.56	111.84	3432.54	112.89
3452.53	111.68	3462.52	112.14	3492.49	112.64	3517.47	112.33	3537.46	112.96
3567.43	112.28	3607.4	113.32	3622.39	114.16	3642.37	114.34	3657.36	115.2
3692.33	115.02	3779	116	3870	118	3921	120	3958	122
3991	124	4056	126	4089	128	4106	130	4124	132

PatuxentRiver.rep

4139	134	4154	136	4167	138	4180	140	4193	142
4207	144	4215	146	4220	148	4225	150	4243	151

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1843	.03	1884	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.	
	1843	1884		801.4	802.52	801.75	.1	.3

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	116.14	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	116.08	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	2137.27	121.79
4395.76				
E.G. Slope (ft/ft)	0.002637	Area (sq ft)	2137.27	121.79
4395.76				
Q Total (cfs)	8893.00	Flow (cfs)	2379.06	617.68
5896.26				
Top Width (ft)	3148.48	Top Width (ft)	1212.34	41.00
1895.14				
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	1.11	5.07
1.34				
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)	1.76	2.97
2.32				
Conv. Total (cfs)	173189.3	Conv. (cfs)	46331.7	12029.2
114828.3				
Length Wtd. (ft)	801.69	Wetted Per. (ft)	1212.90	43.25
1900.50				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.29	0.46
0.38				
Alpha	1.85	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	9903.71	7751.88
14768.74				
C & E Loss (ft)	0.01	Cum SA (acres)	2311.95	691.74
3057.80				

Warning: Divided flow computed for this cross-section.  
 Warning: The conveyance ratio (upstream conveyance divided by downstream

conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft)	118.15	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	118.10	Reach Len. (ft)	801.40	802.52
801.75				
Crit W.S. (ft)		Flow Area (sq ft)	3592.87	204.49
6884.32				
E.G. Slope (ft/ft)	0.001248	Area (sq ft)	3592.87	204.49
6884.32				
Q Total (cfs)	15174.00	Flow (cfs)	4554.40	1007.99
9611.61				
Top Width (ft)	2570.00	Top Width (ft)	953.00	41.00
1576.00				
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	1.27	4.93
1.40				
Max Chl Dpth (ft)	11.53	Hydr. Depth (ft)	3.77	4.99
4.37				
Conv. Total (cfs)	429490.7	Conv. (cfs)	128909.6	28530.4
272050.7				
Length Wtd. (ft)	801.67	Wetted Per. (ft)	957.57	43.25
1587.34				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.29	0.37
0.34				
Alpha	1.65	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.65	Cum Volume (acre-ft)	12866.48	10578.42
20268.41				
C & E Loss (ft)	0.01	Cum SA (acres)	1548.87	701.56
2257.99				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft)	120.26	Element	Left OB	Channel
Right OB				

PatuxentRiver.rep				
Vel Head (ft) 0.100	0.04	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	120.22	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 12580.92		Flow Area (sq ft)	7181.05	291.21
E.G. Slope (ft/ft) 12580.92	0.000662	Area (sq ft)	7181.05	291.21
Q Total (cfs) 16142.54	26361.00	Flow (cfs)	8895.18	1323.28
Top Width (ft) 2041.00	3312.38	Top Width (ft)	1230.38	41.00
Vel Total (ft/s) 1.28	1.31	Avg. Vel. (ft/s)	1.24	4.54
Max Chl Dpth (ft) 6.16	13.65	Hydr. Depth (ft)	5.84	7.10
Conv. Total (cfs) 627362.7	1024492.0	Conv. (cfs)	345701.6	51428.0
Length Wtd. (ft) 2046.43	801.67	Wetted Per. (ft)	1231.43	43.25
Min Ch El (ft) 0.25	112.33	Shear (lb/sq ft)	0.24	0.28
Alpha 0.00	1.48	Stream Power (lb/ft s)	4243.00	0.00
Frctn Loss (ft) 31977.04	0.30	Cum Volume (acre-ft)	23174.54	11432.28
C & E Loss (ft) 3800.78	0.01	Cum SA (acres)	3135.03	701.27

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500yr

E.G. Elev (ft) Right OB	124.42	Element	Left OB	Channel
Vel Head (ft) 0.100	0.03	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 801.75	124.38	Reach Len. (ft)	801.40	802.52
Crit W.S. (ft) 21240.13		Flow Area (sq ft)	12486.43	462.02
E.G. Slope (ft/ft) 21240.13	0.000304	Area (sq ft)	12486.43	462.02

PatuxentRiver.rep				
Q Total (cfs)	41717.00	Flow (cfs)	14228.39	1936.57
25552.04				
Top Width (ft)	3514.34	Top Width (ft)	1353.91	41.00
2119.43				
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	1.14	4.19
1.20				
Max Chl Dpth (ft)	17.81	Hydr. Depth (ft)	9.22	11.27
10.02				
Conv. Total (cfs)	2390981.0	Conv. (cfs)	815490.4	110993.0
1464498.0				
Length Wtd. (ft)	801.66	Wetted Per. (ft)	1355.07	43.25
2124.97				
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.18	0.20
0.19				
Alpha	1.44	Stream Power (lb/ft s)	4243.00	0.00
0.00				
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	33678.79	13576.45
45222.04				
C & E Loss (ft)	0.01	Cum SA (acres)	3522.75	703.06
4357.94				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

#### CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190879.0

#### INPUT

Description: old section 110.1 (Laruel study)

Station Elevation Data num= 179

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	136	44	134	80	132	118	130	138	128
162	126	202	124	281	122	418	120	519.98	117.84
554.98	117.41	564.98	116.68	579.98	116.76	594.98	115.85	604.98	115.94
624.97	114.71	639.97	114.85	649.97	114.33	669.97	114.15	689.97	113.05
694.97	113.7	719.97	112.5	734.97	112.93	749.97	112.23	779.97	112.45
789.97	111.93	804.97	112.2	824.97	111.92	849.97	112.2	859.97	111.94
989.96	111.86	1014.96	112.55	1044.96	111.97	1064.96	112.45	1079.96	111.86
1134.95	111.88	1149.95	112.19	1169.95	113.21	1189.95	112.49	1219.95	112.97
1259.95	111.95	1279.95	112.79	1294.95	111.92	1354.94	111.94	1384.94	112.49
1399.94	111.95	1434.94	112.31	1454.94	111.97	1474.94	113.49	1494.94	112.28
1509.94	112.42	1524.94	111.99	1554.93	113.17	1589.93	112.63	1644.93	112.66

PatuxentRiver.rep

1659.93	113.1	1684.93	112.48	1769.92	113.16	1799.92	112.08	1814.92	112.44
1824.92	113.91	1834.92	114.27	1866.04	114.19	1867.4	113.64	1867.465	110.96
1872.5	108.76	1878.39	110.86	1878.675	113.83	1904.515	114.24	1914.92	112.81
1939.92	114.24	1959.91	112.66	1979.91	113.44	2004.91	112.68	2014.91	113.01
2029.91	112.64	2074.89	112.93	2089.88	112.53	2104.87	113.06	2139.84	112.63
2164.82	113.06	2239.77	112.47	2259.75	111.91	2289.73	111.93	2324.7	112.4
2339.69	113.19	2364.67	112.94	2379.66	112.26	2459.59	112.26	2479.58	112.79
2499.56	112.48	2524.54	112.72	2569.51	112.02	2599.48	112.13	2604.48	112.54
2654.44	111.84	2714.39	112.02	2754.36	111.88	2774.35	112.46	2784.34	112.04
2814.32	112.1	2839.3	112.47	2884.26	112.37	2909.24	111.67	2924.23	113.25
2944.21	111.39	2959.2	113.67	2964.2	113.7	2984.18	109.53	2999.17	111.14
3014.16	111.51	3029.15	111.2	3039.14	108.52	3044.14	105.82	3054.13	110.29
3064.12	111.42	3069.12	110.55	3084.1	112.72	3104.09	112.47	3124.07	112.76
3149.05	110.95	3169.04	111.83	3189.02	110.94	3194.02	111.59	3204.01	110.95
3214	111.77	3228.99	111.34	3243.98	112.68	3258.97	112.11	3278.95	112.29
3303.93	111.91	3313.93	112.29	3333.91	111.83	3348.9	112.16	3363.89	111.54
3378.87	112.73	3388.87	112.2	3423.84	111.85	3438.83	112.64	3458.81	111.65
3478.8	112.47	3498.78	114.12	3548.74	111.33	3558.73	111.56	3593.71	111.21
3643.67	111.33	3668.65	112.08	3683.64	110.97	3723.6	110.92	3748.59	111.21
3758.58	110.93	3788.55	111.18	3833.52	111.25	3848.51	111.72	3863.5	111.31
3898.47	111.19	3913.46	111.59	3938.44	111	3978.41	111.34	4023.37	110.96
4123.29	111	4138.28	111.3	4163.26	111.09	4203.23	111.69	4238.2	112.97
4258.19	113.37	4273.18	112.24	4298.16	111.42	4313.14	111.39	4328.13	112.17
4348.12	114.49	4378.09	116.23	4501.68	126.11	4526.31	129.48	4570.65	132.16
4605.14	133.05	4649.48	136.44	4708.6	140.35	4723.38	140.77		

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .1 1867.4	.031904.515	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
1867.4	1904.515	697.31	727.92	802.22	.1	.3	

CROSS SECTION OUTPUT Profile #10yr

E.G. Elev (ft)	115.22	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	115.21	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	3318.91	89.96
7874.60				
E.G. Slope (ft/ft)	0.000624	Area (sq ft)	3318.91	89.96
7874.60				
Q Total (cfs)	8893.00	Flow (cfs)	2361.45	181.41
6350.13				

PatuxentRiver.rep

Top Width (ft) 2455.94	3743.54	Top Width (ft)	1250.49	37.11
Vel Total (ft/s) 0.81	0.79	Avg. Vel. (ft/s)	0.71	2.02
Max Chl Dpth (ft) 3.21	9.39	Hydr. Depth (ft)	2.65	2.42
Conv. Total (cfs) 254119.2	355879.5	Conv. (cfs)	94500.5	7259.8
Length Wtd. (ft) 2460.41	779.48	Wetted Per. (ft)	1251.21	43.26
Min Ch El (ft) 0.12	108.76	Shear (lb/sq ft)	0.10	0.08
Alpha 0.00	1.10	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 14655.82	0.36	Cum Volume (acre-ft)	9853.52	7749.93
C & E Loss (ft) 3017.76	0.00	Cum SA (acres)	2289.30	691.02

CROSS SECTION OUTPUT Profile #50yr

E.G. Elev (ft) Right OB	117.49	Element	Left OB	Channel
Vel Head (ft) 0.100	0.02	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	117.47	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 8522.91		Flow Area (sq ft)	5384.39	174.04
E.G. Slope (ft/ft) 8522.91	0.000570	Area (sq ft)	5384.39	174.04
Q Total (cfs) 9054.31	15174.00	Flow (cfs)	5598.94	520.75
Top Width (ft) 1635.49	2740.00	Top Width (ft)	1067.40	37.11
Vel Total (ft/s) 1.06	1.08	Avg. Vel. (ft/s)	1.04	2.99
Max Chl Dpth (ft) 5.21	11.65	Hydr. Depth (ft)	5.04	4.69
Conv. Total (cfs) 379159.8	635428.8	Conv. (cfs)	234461.9	21807.1
Length Wtd. (ft) 1645.24	770.66	Wetted Per. (ft)	1073.31	43.26
Min Ch El (ft) 0.18	108.76	Shear (lb/sq ft)	0.18	0.14



PatuxentRiver.rep

Alpha 0.00	1.19	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 20126.63	0.39	Cum Volume (acre-ft)	12783.90	10574.93
C & E Loss (ft) 2228.44	0.00	Cum SA (acres)	1530.28	700.84

CROSS SECTION OUTPUT Profile #100yr

E.G. Elev (ft) Right OB	119.95	Element	Left OB	Channel
Vel Head (ft) 0.100	0.01	Wt. n-Val.	0.100	0.030
W.S. Elev (ft) 802.22	119.93	Reach Len. (ft)	697.31	727.92
Crit W.S. (ft) 19644.93		Flow Area (sq ft)	9638.62	265.42
E.G. Slope (ft/ft) 19644.93	0.000241	Area (sq ft)	9638.62	265.42
Q Total (cfs) 17802.36	26361.00	Flow (cfs)	7874.34	684.30
Top Width (ft) 2519.90	4003.27	Top Width (ft)	1446.25	37.11
Vel Total (ft/s) 0.91	0.89	Avg. Vel. (ft/s)	0.82	2.58
Max Chl Dpth (ft) 7.80	14.11	Hydr. Depth (ft)	6.66	7.15
Conv. Total (cfs) 1146278.0	1697360.0	Conv. (cfs)	507021.1	44061.7
Length Wtd. (ft) 2524.55	773.94	Wetted Per. (ft)	1447.08	43.26
Min Ch El (ft) 0.12	108.76	Shear (lb/sq ft)	0.10	0.09
Alpha 0.00	1.16	Stream Power (lb/ft s)	4723.38	0.00
Frctn Loss (ft) 31680.48	0.17	Cum Volume (acre-ft)	23019.82	11427.15
C & E Loss (ft) 3758.81	0.00	Cum SA (acres)	3110.40	700.55

CROSS SECTION OUTPUT Profile #500yr

PatuxentRiver.rep				
	Element	Left	OB	Channel
E.G. Elev (ft)	124.25			
Right OB				
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030
0.100				
W.S. Elev (ft)	124.24	Reach Len. (ft)	697.31	727.92
802.22				
Crit W.S. (ft)		Flow Area (sq ft)	16422.09	425.24
30611.88				
E.G. Slope (ft/ft)	0.000136	Area (sq ft)	16422.09	425.24
30611.88				
Q Total (cfs)	41717.00	Flow (cfs)	13033.80	1125.27
27557.93				
Top Width (ft)	4281.07	Top Width (ft)	1670.19	37.11
2573.77				
Vel Total (ft/s)	0.88	Avg. Vel. (ft/s)	0.79	2.65
0.90				
Max Chl Dpth (ft)	18.42	Hydr. Depth (ft)	9.83	11.46
11.89				
Conv. Total (cfs)	3583358.0	Conv. (cfs)	1119562.0	96657.1
2367139.0				
Length Wtd. (ft)	772.15	Wetted Per. (ft)	1671.06	43.26
2578.59				
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.08	0.08
0.10				
Alpha	1.19	Stream Power (lb/ft s)	4723.38	0.00
0.00				
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	33412.86	13568.28
44744.86				
C & E Loss (ft)	0.00	Cum SA (acres)	3494.94	702.34
4314.75				

CROSS SECTION

RIVER: Patuxent River

REACH: 1

RS: 190151.1

INPUT

Description: old section 110 (Laurel study)

Station Elevation Data

num= 201

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	138.02	10	137.21	59.99	135.81	79.99	134.8	139.99	133.2
154.99	133.33	179.98	132.05	224.98	131.03	234.98	131.87	254.98	132.03
264.98	131.07	274.98	128.58	289.97	122.91	304.97	118.05	314.97	115.58
334.97	112.42	339.97	112.01	359.97	112.24	379.97	112.06	394.96	113.42
414.96	114.11	429.96	111.95	449.96	112.24	464.96	113.17	484.96	113.51



HEC-RAS Plan: Plan 03 River: Patuxent River Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	193357.9	500yr	41717.00	112.60	124.91	120.00	125.18	0.001046	8.00	14543.56	3948.63	0.41
1	193176.6	10yr	8893.00	112.30	119.01	117.25	119.04	0.000309	2.42	7620.29	2411.84	0.17
1	193176.6	50yr	15174.00	112.30	120.12	117.26	120.17	0.000385	3.02	10465.55	2645.51	0.20
1	193176.6	100yr	26361.00	112.30	121.64	117.32	121.71	0.000461	3.74	14511.21	2714.02	0.22
1	193176.6	500yr	41717.00	112.30	124.97	118.02	125.02	0.000323	3.87	27282.01	4395.15	0.19
1	192867	10yr	8893.00	112.30	118.91		118.93	0.000311	2.11	8220.85	2921.08	0.17
1	192867	50yr	15174.00	112.30	120.00		120.04	0.000413	2.73	11472.96	3147.48	0.20
1	192867	100yr	26361.00	112.30	121.50		121.56	0.000468	3.24	16377.49	3389.22	0.22
1	192867	500yr	41717.00	112.30	124.89		124.93	0.000247	2.81	29732.63	4263.08	0.17
1	192774.7	10yr	8893.00	112.35	118.73		118.87	0.001846	5.54	5788.95	3033.94	0.41
1	192774.7	50yr	15174.00	112.35	119.85		119.96	0.001519	5.67	9248.04	3113.49	0.38
1	192774.7	100yr	26361.00	112.35	121.36		121.48	0.001410	6.24	14085.81	3400.29	0.38
1	192774.7	500yr	41717.00	112.35	124.83		124.89	0.000547	4.91	27380.30	4135.03	0.25
1	192514.9	10yr	8893.00	112.40	118.10	116.87	118.28	0.002582	6.49	5474.76	2757.59	0.49
1	192514.9	50yr	15174.00	112.40	119.31	117.77	119.47	0.002169	6.81	8446.41	2612.88	0.47
1	192514.9	100yr	26361.00	112.40	120.93	118.59	121.07	0.001662	6.91	14884.59	3812.49	0.43
1	192514.9	500yr	41717.00	112.40	124.68	119.34	124.74	0.000562	5.17	28444.77	4684.82	0.26
1	191681.5	10yr	8893.00	112.33	116.08		116.14	0.002637	5.07	6654.83	3148.48	0.52
1	191681.5	50yr	15174.00	112.33	118.10		118.15	0.001248	4.93	10681.68	2570.00	0.39
1	191681.5	100yr	26361.00	112.33	120.22		120.26	0.000662	4.54	20053.18	3312.38	0.30
1	191681.5	500yr	41717.00	112.33	124.38		124.42	0.000304	4.19	34188.59	3514.34	0.22
1	190879.0	10yr	8893.00	108.76	115.21		115.22	0.000624	2.02	11283.47	3743.54	0.23
1	190879.0	50yr	15174.00	108.76	117.47		117.49	0.000570	2.99	14081.35	2740.00	0.24
1	190879.0	100yr	26361.00	108.76	119.93		119.95	0.000241	2.58	29548.97	4003.27	0.17
1	190879.0	500yr	41717.00	108.76	124.24		124.25	0.000136	2.65	47459.21	4281.07	0.14
1	190151.1	10yr	8893.00	107.76	114.85		114.86	0.000354	1.79	14999.81	3904.10	0.18
1	190151.1	50yr	15174.00	107.76	117.09		117.11	0.000442	2.88	16929.67	2780.00	0.22
1	190151.1	100yr	26361.00	107.76	119.76		119.77	0.000205	2.57	34376.64	3971.55	0.16
1	190151.1	500yr	41717.00	107.76	124.14		124.15	0.000133	2.78	51863.18	4032.87	0.14
1	189009.2	10yr	8893.00	105.79	114.66		114.67	0.000255	2.29	15729.25	3550.54	0.15
1	189009.2	50yr	15174.00	105.79	116.85		116.87	0.000325	3.10	18020.66	2650.00	0.18
1	189009.2	100yr	26361.00	105.79	119.63		119.65	0.000193	2.85	33644.49	3676.91	0.15
1	189009.2	500yr	41717.00	105.79	124.05		124.07	0.000132	2.91	50121.02	3772.56	0.13
1	188388.2	10yr	8893.00	104.79	114.56		114.58	0.000300	2.70	14440.48	3366.42	0.17
1	188388.2	50yr	15174.00	104.79	116.72		116.75	0.000367	3.50	16897.36	2530.00	0.19
1	188388.2	100yr	26361.00	104.79	119.56		119.58	0.000218	3.19	31237.33	3453.66	0.16
1	188388.2	500yr	41717.00	104.79	124.00		124.02	0.000153	3.25	46255.55	3583.05	0.14
1	187454.7	10yr	8893.00	104.76	114.23		114.30	0.000785	4.58	8365.11	2051.62	0.28
1	187454.7	50yr	15174.00	104.76	116.39		116.46	0.000663	4.92	12134.36	1840.00	0.27
1	187454.7	100yr	26361.00	104.76	119.30		119.37	0.000588	5.46	18420.26	2194.31	0.26
1	187454.7	500yr	41717.00	104.76	123.80		123.87	0.000408	5.53	27914.09	2362.00	0.23
1	186994.1	10yr	8893.00	103.26	113.74		113.93	0.001094	6.36	6915.98	2114.91	0.39
1	186994.1	50yr	15174.00	103.26	116.00		116.17	0.000833	6.53	10562.27	1730.00	0.36
1	186994.1	100yr	26361.00	103.26	119.00		119.14	0.000629	6.72	17681.82	2541.97	0.32
1	186994.1	500yr	41717.00	103.26	123.63		123.73	0.000354	6.14	28268.17	2738.80	0.26
1	186902.0	10yr	8893.00	103.26	113.38	112.38	113.72	0.001771	7.85	5917.41	1986.96	0.50
1	186902.0	50yr	15174.00	103.26	115.85	113.26	116.05	0.000975	7.00	10103.72	1780.00	0.39
1	186902.0	100yr	26361.00	103.26	118.91	114.30	119.06	0.000682	6.97	18369.61	2442.70	0.34
1	186902.0	500yr	41717.00	103.26	123.58	115.47	123.69	0.000375	6.32	30250.56	2873.55	0.26
1	186867.8		Bridge									
1	186829.2	10yr	8893.00	103.26	112.58		113.24	0.003460	10.21	4379.23	1787.86	0.68
1	186829.2	50yr	15174.00	103.26	115.60		115.82	0.001134	7.42	9577.43	1765.00	0.41
1	186829.2	100yr	26361.00	103.26	118.74		118.90	0.000754	7.26	17688.67	2416.72	0.35
1	186829.2	500yr	41717.00	103.26	123.49		123.60	0.000392	6.44	30045.50	3034.18	0.27
1	186756.8	10yr	8893.00	104.03	112.68		112.80	0.001230	4.95	6956.11	1981.12	0.35
1	186756.8	50yr	15174.00	104.03	115.59		115.68	0.000655	4.64	11532.65	1760.00	0.27
1	186756.8	100yr	26361.00	104.03	118.73		118.80	0.000468	4.77	20492.21	2428.47	0.24
1	186756.8	500yr	41717.00	104.03	123.48		123.54	0.000259	4.40	33946.61	3285.97	0.19
1	186101	10yr	8893.00	102.37	112.28		112.33	0.000542	3.95	9891.02	2194.56	0.23

## **Appendix M**

### **Tractive Force Section and Excel Comparison**

**TRACTIVE FORCE SUMMARY FOR 10-YR STORM**

Cross Section #	Existing (Without Berm)			V(ft/s)
	Shear (lb/sq. ft) - 10 yr Storm			
	LOB	Channel	ROB	
201119	0.67	1.76	0.85	6.09
201058.7	0.86	1.83	0.45	3.91
200115.4	0.59	0.88	0.24	2.21
198588	0.22	0.54	0.22	1.45
197599.6	0.12	0.35	0.17	1.27
196568.8	0.23	1.64	0.4	2.27
196356.8	0.21	1.25	0.34	2.2
195583.1		1.08	0.39	2.65
194817.8		0.09	0.06	1.06
193854.4	0.02	0.09	0.05	0.89
193357.9	0.02	0.09	0.05	0.9
193176.6	0.04	0.17	0.09	1.2
192867	0.28	1.46	0.45	2.65
192774.7	0.11	0.53	0.24	1.47
192514.9	0.18	0.84	0.39	1.62
191681.5	0.29	0.46	0.38	1.34
190879	0.1	0.08	0.12	0.79

Cross Section #	Existing (With Berm)			V(ft/s)
	Shear (lb/sq. ft) - 10 yr Storm			
	LOB	Channel	ROB	
201119	0.67	1.76	0.85	6.09
201058.7	0.86	1.83	0.45	3.92
200115.4	0.59	0.87	0.24	2.21
198588	0.22	0.55	0.22	1.47
197599.6	0.14	0.41	0.2	1.34
196568.8	0.13	0.6	0.2	1.49
196356.8	0.07	0.28	0.12	1.16
195583.1	0.03	0.08	0.05	0.71
194817.8	0.06	0.13	0.1	1.02
193854.4	0.33	0.71	0.23	1.88
193357.9	0.52	1.55	0.31	3.52
193176.6	0.66	2.17	0.48	3.45
192867	0.28	1.46	0.45	2.65
192774.7	0.11	0.53	0.24	1.47
192514.9	0.18	0.84	0.39	1.62
191681.5	0.29	0.46	0.38	1.34
190879	0.1	0.08	0.12	0.79

Cross Section #	Proposed			V(ft/s)
	Shear (lb/sq. ft) - 10 yr Storm			
	LOB	Channel	ROB	
201119	0.67	1.76	0.85	6.09
201058.7	0.86	1.83	0.45	3.91
200115.4	0.59	0.88	0.24	2.21
198588	0.22	0.54	0.22	1.45
197599.6	0.12	0.36	0.18	1.28
196568.8	0.22	1.61	0.39	2.24
196356.8	0.26	1.6	0.39	2.47
195583.1		0.32	0.16	1.98
194817.8		0.17	0.12	1.61
193854.4	0.04	0.21	0.18	1.75
193357.9	0.08	0.46	0.31	2.52
193176.6	0.02	0.11	0.08	1.17
192867	0.02	0.09	0.07	1.08
192774.7	0.13	0.61	0.26	1.54
192514.9	0.18	0.84	0.39	1.62
191681.5	0.29	0.46	0.38	1.34
190879	0.1	0.08	0.12	0.79

Cross Section #	% Change compared to Proposed			
	Existing (Without Berm)			
	LOB	Channel	ROB	V(ft/s)
201119	0.0	0.0	0.0	0.0
201058.7	0.0	0.0	0.0	0.0
200115.4	0.0	0.0	0.0	0.0
198588	0.0	0.0	0.0	0.0
197599.6	0.0	2.9	5.9	0.8
196568.8	-4.3	-1.8	-2.5	-1.3
196356.8	23.8	28.0	14.7	12.3

Cross Section #	% Change compared to Proposed			
	Existing (With Berm)			
	LOB	Channel	ROB	V(ft/s)
201119	0.0	0.0	0.0	0.0
201058.7	0.0	0.0	0.0	-0.3
200115.4	0.0	1.1	0.0	0.0
198588	0.0	-1.8	0.0	-1.4
197599.6	-14.3	-12.2	-10.0	-4.5
196568.8	69.2	168.3	95.0	50.3
196356.8	271.4	471.4	225.0	112.9

195583.1		-70.4	-59.0	-25.3
194817.8		88.9	100.0	51.9
193854.4	100.0	133.3	260.0	96.6
193357.9	300.0	411.1	520.0	180.0
193176.6	-50.0	-35.3	-11.1	-2.5
192774.7	18.2	15.1	8.3	4.8
192514.9	0.0	0.0	0.0	0.0
191681.5	0.0	0.0	0.0	0.0
190879	0.0	0.0	0.0	0.0

	300.0	220.0	178.9
	30.8	20.0	57.8
-87.9	-70.4	-21.7	-6.9
-84.6	-70.3	0.0	-28.4
-97.0	-94.9	-83.3	-66.1
18.2	15.1	8.3	4.8
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

## **Tractive Force Section (Hec-ras Output)**

**(Existing without Berm)**



## EXISTING CONDITION WITHOUT BERM

**Cross Section Output** — □ ×

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201119 Plan: Mult

Plan: Mult Patuxent River 1 RS: 201119 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	133.17	Wt. n-Val.	0.100	0.030	0.100
Vel Head (ft)	1.53	Reach Len. (ft)	55.20	60.26	138.48
W.S. Elev (ft)	131.64	Flow Area (sq ft)	478.21	655.35	232.29
Crit W.S. (ft)	131.64	Area (sq ft)	4182.05	655.35	747.25
E.G. Slope (ft/ft)	0.006059	Flow (cfs)	809.71	7052.29	462.00
Q Total (cfs)	8324.00	Top Width (ft)	1767.59	137.00	386.60
Top Width (ft)	2291.19	Avg. Vel. (ft/s)	1.69	10.76	1.99
Vel Total (ft/s)	6.09	Hydr. Depth (ft)	1.77	4.78	2.26
Max Chl Dpth (ft)	9.69	Conv. (cfs)	10402.0	90597.8	5935.1
Conv. Total (cfs)	106934.9	Wetted Per. (ft)	270.00	140.55	103.02
Length Wtd. (ft)	61.35	Shear (lb/sq ft)	0.67	1.76	0.85
Min Ch El (ft)	121.95	Stream Power (lb/ft s)	5543.60	0.00	0.00
Alpha	2.65	Cum Volume (acre-ft)	10158.84	7818.18	16411.24
Frctn Loss (ft)	0.30	Cum SA (acres)	2425.54	703.18	3622.84
C & E Loss (ft)	0.29				

**Cross Section Output** — □ ×

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201058.7 Plan: Mult

Plan: Mult Patuxent River 1 RS: 201058.7 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	132.51	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.95	Reach Len. (ft)	508.58	943.33	306.29
W.S. Elev (ft)	131.56	Flow Area (sq ft)	1616.86	476.47	33.20
Crit W.S. (ft)	130.88	Area (sq ft)	6621.22	476.47	671.45
E.G. Slope (ft/ft)	0.004018	Flow (cfs)	3455.09	4822.52	46.38
Q Total (cfs)	8324.00	Top Width (ft)	1750.23	60.00	247.09
Top Width (ft)	2057.32	Avg. Vel. (ft/s)	2.14	10.12	1.40
Vel Total (ft/s)	3.91	Hydr. Depth (ft)	3.42	7.94	1.84
Max Chl Dpth (ft)	8.60	Conv. (cfs)	54506.2	76078.2	731.7
Conv. Total (cfs)	131316.1	Wetted Per. (ft)	473.16	65.33	18.38
Length Wtd. (ft)	688.35	Shear (lb/sq ft)	0.86	1.83	0.45
Min Ch El (ft)	122.96	Stream Power (lb/ft s)	5020.26	0.00	0.00
Alpha	4.00	Cum Volume (acre-ft)	10152.00	7817.40	16408.99
Frctn Loss (ft)	2.13	Cum SA (acres)	2423.31	703.05	3621.83
C & E Loss (ft)	0.22				

**Cross Section Output** — □ ×

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 200115.4 Plan: Mult

Plan: Mult Patuxent River 1 RS: 200115.4 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	130.16	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.22	Reach Len. (ft)	508.58	943.33	306.29
W.S. Elev (ft)	130.16	Flow Area (sq ft)	1616.86	476.47	33.20
Crit W.S. (ft)	130.16	Area (sq ft)	6621.22	476.47	671.45
E.G. Slope (ft/ft)	0.004018	Flow (cfs)	3455.09	4822.52	46.38
Q Total (cfs)	8324.00	Top Width (ft)	1750.23	60.00	247.09
Top Width (ft)	2057.32	Avg. Vel. (ft/s)	2.14	10.12	1.40
Vel Total (ft/s)	3.91	Hydr. Depth (ft)	3.42	7.94	1.84
Max Chl Dpth (ft)	8.60	Conv. (cfs)	54506.2	76078.2	731.7
Conv. Total (cfs)	131316.1	Wetted Per. (ft)	473.16	65.33	18.38
Length Wtd. (ft)	688.35	Shear (lb/sq ft)	0.86	1.83	0.45
Min Ch El (ft)	122.96	Stream Power (lb/ft s)	5020.26	0.00	0.00
Alpha	4.00	Cum Volume (acre-ft)	10152.00	7817.40	16408.99
Frctn Loss (ft)	2.13	Cum SA (acres)	2423.31	703.05	3621.83
C & E Loss (ft)	0.22				

Vel Head (ft)	0.22	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	129.94	Reach Len. (ft)	1501.45	1527.39	1537.60
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3566.72	352.21	100.94
E.G. Slope (ft/ft)	0.002483	Area (sq ft)	4383.81	352.21	4909.48
Q Total (cfs)	8893.00	Flow (cfs)	6428.25	2364.79	99.95
Top Width (ft)	2689.44	Top Width (ft)	1305.64	57.00	1326.80
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.71	0.99
Max Chl Dpth (ft)	14.52	Hydr. Depth (ft)	3.80	6.18	1.55
Conv. Total (cfs)	178467.8	Conv. (cfs)	129004.4	47457.5	2005.9
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29	65.26
Min Ch El (ft)	122.06	Shear (lb/sq ft)	0.59	0.88	0.24
Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00	0.00
Frctn Loss (ft)	2.95	Cum Volume (acre-ft)	10087.75	7808.42	16389.37
C & E Loss (ft)	0.04	Cum SA (acres)	2405.48	701.78	3616.30

**Cross Section Output** File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 198588.0 Plan: Mult

Plan: Mult Patuxent River 1 RS: 198588.0 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	127.17		
Vel Head (ft)	0.09		
W.S. Elev (ft)	127.08		
Crit W.S. (ft)			
E.G. Slope (ft/ft)	0.001564		
Q Total (cfs)	8893.00		
Top Width (ft)	4725.06		
Vel Total (ft/s)	1.45		
Max Chl Dpth (ft)	11.16		
Conv. Total (cfs)	224854.8		
Length Wtd. (ft)	949.97		
Min Ch El (ft)	119.57		
Alpha	2.85		
Frctn Loss (ft)	1.15		
C & E Loss (ft)	0.01		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	993.28	988.41	937.73
Flow Area (sq ft)	1548.97	289.58	4290.31
Area (sq ft)	1548.97	289.58	11861.14
Flow (cfs)	1565.54	1511.20	5816.26
Top Width (ft)	686.59	50.00	3988.47
Avg. Vel. (ft/s)	1.01	5.22	1.36
Hydr. Depth (ft)	2.26	5.79	2.23
Conv. (cfs)	39583.8	38209.9	147061.1
Wetted Per. (ft)	686.79	52.85	1927.71
Shear (lb/sq ft)	0.22	0.54	0.22
Stream Power (lb/ft s)	5710.31	0.00	0.00
Cum Volume (acre-ft)	9985.51	7797.17	16093.38
Cum SA (acres)	2371.14	699.90	3522.49

**Cross Section Output** File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 197599.6 Plan: Mult

Plan: Mult Patuxent River 1 RS: 197599.6 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	126.01		
Vel Head (ft)	0.05		
W.S. Elev (ft)	125.95		
Crit W.S. (ft)			
E.G. Slope (ft/ft)	0.000967		
Q Total (cfs)	8893.00		
Top Width (ft)	4175.71		
Vel Total (ft/s)	1.27		
Max Chl Dpth (ft)	10.33		
Conv. Total (cfs)	286025.2		
Length Wtd. (ft)	1011.57		
Min Ch El (ft)	117.91		
Alpha	2.04		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	1000.40	1030.79	1005.50
Flow Area (sq ft)	77.45	234.63	6668.97
Area (sq ft)	77.45	234.63	14642.45
Flow (cfs)	56.06	1008.51	7828.42
Top Width (ft)	38.86	37.00	4099.85
Avg. Vel. (ft/s)	0.72	4.30	1.17
Hydr. Depth (ft)	1.99	6.34	2.90
Conv. (cfs)	1803.2	32436.7	251785.3
Wetted Per. (ft)	39.48	39.93	2301.22
Shear (lb/sq ft)	0.12	0.35	0.17
Stream Power (lb/ft s)	5478.15	0.00	0.00

Frctn Loss (ft)	1.81	Cum Volume (acre-ft)	9966.96	7791.23	15808.10
C & E Loss (ft)	0.05	Cum SA (acres)	2362.87	698.92	3435.43

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196568.8 Plan: Mult

Plan: Mult Patuxent River 1 RS: 196568.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	124.15	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.52	Reach Len. (ft)	208.00	212.00	210.00
W.S. Elev (ft)	123.63	Flow Area (sq ft)	74.03	354.00	3495.66
Crit W.S. (ft)	123.63	Area (sq ft)	74.03	354.00	6044.23
E.G. Slope (ft/ft)	0.004380	Flow (cfs)	63.98	3287.64	5541.38
Q Total (cfs)	8893.00	Top Width (ft)	89.83	56.00	3403.92
Top Width (ft)	3549.75	Avg. Vel. (ft/s)	0.86	9.29	1.59
Vel Total (ft/s)	2.27	Hydr. Depth (ft)	0.82	6.32	1.47
Max Chl Dpth (ft)	9.63	Conv. (cfs)	966.8	49677.1	83731.5
Conv. Total (cfs)	134375.3	Wetted Per. (ft)	89.85	58.91	2386.97
Length Wtd. (ft)		Shear (lb/sq ft)	0.23	1.64	0.40
Min Ch El (ft)	115.84	Stream Power (lb/ft s)	4607.00	0.00	0.00
Alpha	6.51	Cum Volume (acre-ft)	9965.23	7784.26	15569.35
Frctn Loss (ft)		Cum SA (acres)	2361.39	697.82	3348.82
C & E Loss (ft)					

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196356.8 Plan: Mult

Plan: Mult Patuxent River 1 RS: 196356.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	123.26	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.42	Reach Len. (ft)	758.14	773.69	678.90
W.S. Elev (ft)	122.84	Flow Area (sq ft)	44.89	441.05	3548.39
Crit W.S. (ft)	122.63	Area (sq ft)	44.89	441.05	9158.30
E.G. Slope (ft/ft)	0.003419	Flow (cfs)	38.82	3554.46	5299.72
Q Total (cfs)	8893.00	Top Width (ft)	44.93	68.23	3842.88
Top Width (ft)	3956.05	Avg. Vel. (ft/s)	0.86	8.06	1.49
Vel Total (ft/s)	2.20	Hydr. Depth (ft)	1.00	6.46	1.58
Max Chl Dpth (ft)	7.42	Conv. (cfs)	664.0	60791.4	90640.5
Conv. Total (cfs)	152095.8	Wetted Per. (ft)	45.19	75.40	2243.28
Length Wtd. (ft)	705.54	Shear (lb/sq ft)	0.21	1.25	0.34
Min Ch El (ft)	115.42	Stream Power (lb/ft s)	5128.00	0.00	0.00
Alpha	5.62	Cum Volume (acre-ft)	9964.94	7782.33	15532.70
Frctn Loss (ft)	2.68	Cum SA (acres)	2361.07	697.51	3331.35
C & E Loss (ft)	0.07				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 195583.1 Plan: Mult

Plan: Mult Patuxent River 1 RS: 195583.1 Profile: 10yr

E.G. Elev (ft)	120.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.		0.035	0.059
W.S. Elev (ft)	120.33	Reach Len. (ft)	614.52	765.33	638.85
Crit W.S. (ft)		Flow Area (sq ft)		200.67	3157.22
E.G. Slope (ft/ft)	0.004246	Area (sq ft)		200.67	7843.59
Q Total (cfs)	8893.00	Flow (cfs)		1412.42	7480.58
Top Width (ft)	3760.16	Top Width (ft)		45.56	3714.60
Vel Total (ft/s)	2.65	Avg. Vel. (ft/s)		7.04	2.37
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)		4.40	1.48
Conv. Total (cfs)	136482.1	Conv. (cfs)		21676.7	114805.4
Length Wtd. (ft)	651.88	Wetted Per. (ft)		49.44	2131.23
Min Ch EI (ft)	113.45	Shear (lb/sq ft)		1.08	0.39
Alpha	1.80	Stream Power (lb/ft s)	6050.74	0.00	0.00
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	9964.55	7776.63	15400.21
C & E Loss (ft)	0.05	Cum SA (acres)	2360.68	696.50	3272.46

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 194817.8 Plan: Mult

Plan: Mult Patuxent River 1 RS: 194817.8 Profile: 10yr

E.G. Elev (ft)	119.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	0.056
W.S. Elev (ft)	119.89	Reach Len. (ft)	862.16	963.36	666.85
Crit W.S. (ft)		Flow Area (sq ft)		203.35	8190.01
E.G. Slope (ft/ft)	0.000362	Area (sq ft)		203.35	12368.46
Q Total (cfs)	8893.00	Flow (cfs)		420.38	8472.62
Top Width (ft)	3992.95	Top Width (ft)		45.68	3947.27
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)		2.07	1.03
Max Chl Dpth (ft)	6.94	Hydr. Depth (ft)		4.45	2.62
Conv. Total (cfs)	467710.1	Conv. (cfs)		22109.3	445600.8
Length Wtd. (ft)	686.15	Wetted Per. (ft)		49.62	3130.65
Min Ch EI (ft)	112.95	Shear (lb/sq ft)		0.09	0.06
Alpha	1.09	Stream Power (lb/ft s)	5597.03	0.00	0.00
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	9964.55	7773.08	15252.00
C & E Loss (ft)	0.00	Cum SA (acres)	2360.68	695.70	3216.28

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193854.4 Plan: Mult

Plan: Mult Patuxent River 1 RS: 193854.4 Profile: 10yr

E.G. Elev (ft)	119.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035	0.056
W.S. Elev (ft)	119.68	Reach Len. (ft)	512.60	496.50	483.90
Crit W.S. (ft)		Flow Area (sq ft)	708.71	296.72	8984.09
E.G. Slope (ft/ft)	0.000252	Area (sq ft)	708.71	296.72	10632.63
Q Total (cfs)	8893.00	Flow (cfs)	174.50	622.66	8095.84
Top Width (ft)	3835.75	Top Width (ft)	675.10	50.00	3110.65
Vel Total (ft/s)	0.89	Avg. Vel. (ft/s)	0.25	2.10	0.90
Max Chl Dpth (ft)	7.38	Hydr. Depth (ft)	1.05	5.93	3.07
Conv. Total (cfs)	560480.0	Conv. (cfs)	10997.8	39243.0	510239.3
Length Wtd. (ft)	485.73	Wetted Per. (ft)	675.38	53.97	2928.46
Min Ch EI (ft)	112.30	Shear (lb/sq ft)	0.02	0.09	0.05

Min Ch El (ft)	112.30	Shear (lb/sq ft)	0.02	0.09	0.05
Alpha	1.32	Stream Power (lb/ft s)	5493.45	0.00	0.00
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	9957.54	7767.55	15075.94
C & E Loss (ft)	0.00	Cum SA (acres)	2354.00	694.64	3162.25

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193357.9 Plan: Mult

Plan: Mult Patuxent River 1 RS: 193357.9 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.58	Wt. n-Val.	0.100	0.030	0.055
Vel Head (ft)	0.02	Reach Len. (ft)	178.50	181.30	183.70
W.S. Elev (ft)	119.56	Flow Area (sq ft)	778.06	411.93	8676.09
Crit W.S. (ft)		Area (sq ft)	778.06	411.93	10380.06
E.G. Slope (ft/ft)	0.000237	Flow (cfs)	231.98	1036.38	7624.65
Q Total (cfs)	8893.00	Top Width (ft)	522.83	65.00	2853.46
Top Width (ft)	3441.29	Avg. Vel. (ft/s)	0.30	2.52	0.88
Vel Total (ft/s)	0.90	Hydr. Depth (ft)	1.49	6.34	3.07
Max Chl Dpth (ft)	6.96	Conv. (cfs)	15069.7	67324.5	495308.8
Conv. Total (cfs)	577703.0	Wetted Per. (ft)	522.84	68.72	2826.81
Length Wtd. (ft)	183.19	Shear (lb/sq ft)	0.02	0.09	0.05
Min Ch El (ft)	112.60	Stream Power (lb/ft s)	5267.00	0.00	0.00
Alpha	1.73	Cum Volume (acre-ft)	9948.79	7763.51	14959.22
Frctn Loss (ft)	0.06	Cum SA (acres)	2346.95	693.99	3129.13
C & E Loss (ft)	0.00				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193176.6 Plan: Mult

Plan: Mult Patuxent River 1 RS: 193176.6 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.52	Wt. n-Val.	0.100	0.035	0.055
Vel Head (ft)	0.04	Reach Len. (ft)	299.20	309.60	325.30
W.S. Elev (ft)	119.48	Flow Area (sq ft)	1093.83	405.50	5939.95
Crit W.S. (ft)		Area (sq ft)	1093.83	405.50	7900.62
E.G. Slope (ft/ft)	0.000434	Flow (cfs)	453.81	1224.11	7215.08
Q Total (cfs)	8893.00	Top Width (ft)	829.36	60.00	1917.22
Top Width (ft)	2806.58	Avg. Vel. (ft/s)	0.41	3.02	1.21
Vel Total (ft/s)	1.20	Hydr. Depth (ft)	1.32	6.76	3.14
Max Chl Dpth (ft)	7.18	Conv. (cfs)	21774.8	58734.9	346192.5
Conv. Total (cfs)	426702.2	Wetted Per. (ft)	829.65	64.34	1892.31
Length Wtd. (ft)	319.71	Shear (lb/sq ft)	0.04	0.17	0.09
Min Ch El (ft)	112.30	Stream Power (lb/ft s)	5282.77	0.00	0.00
Alpha	1.72	Cum Volume (acre-ft)	9944.95	7761.81	14920.68
Frctn Loss (ft)	0.33	Cum SA (acres)	2344.18	693.73	3119.07
C & E Loss (ft)	0.04				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 192867 Plan: Mult

Plan: Mult Patuxent River 1 RS: 192867 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.16	Wt. n-Val.	0.100	0.035	0.055
Vel Head (ft)	0.39	Reach Len. (ft)	93.00	92.30	92.00
W.S. Elev (ft)	118.76	Flow Area (sq ft)	986.58	327.57	2047.47
Crit W.S. (ft)		Area (sq ft)	986.58	327.57	2104.48
E.G. Slope (ft/ft)	0.005052	Flow (cfs)	969.66	2739.45	5183.89
Q Total (cfs)	8893.00	Top Width (ft)	1098.81	68.56	1422.49
Top Width (ft)	2589.85	Avg. Vel. (ft/s)	0.98	8.36	2.53
Vel Total (ft/s)	2.65	Hydr. Depth (ft)	0.90	4.78	1.44
Max Chl Dpth (ft)	6.46	Conv. (cfs)	13642.6	38542.6	72934.5
Conv. Total (cfs)	125119.7	Wetted Per. (ft)	1098.95	71.00	1422.58
Length Wtd. (ft)	92.18	Shear (lb/sq ft)	0.28	1.46	0.45
Min Ch EI (ft)	112.30	Stream Power (lb/ft s)	5084.00	0.00	0.00
Alpha	3.63	Cum Volume (acre-ft)	9937.81	7759.20	14883.32
Frctn Loss (ft)	0.24	Cum SA (acres)	2337.56	693.27	3106.60
C & E Loss (ft)	0.08				

Cross Section Output

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192774.7 Plan: Mult

Plan: Mult Patuxent River 1 RS: 192774.7 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.83	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.11	Reach Len. (ft)	261.34	259.80	275.16
W.S. Elev (ft)	118.71	Flow Area (sq ft)	1206.93	391.02	4442.56
Crit W.S. (ft)		Area (sq ft)	1206.93	391.02	4442.56
E.G. Slope (ft/ft)	0.001612	Flow (cfs)	798.63	2021.39	6072.98
Q Total (cfs)	8893.00	Top Width (ft)	1098.46	69.00	1859.83
Top Width (ft)	3027.28	Avg. Vel. (ft/s)	0.66	5.17	1.37
Vel Total (ft/s)	1.47	Hydr. Depth (ft)	1.10	5.67	2.39
Max Chl Dpth (ft)	6.91	Conv. (cfs)	19893.2	50351.2	151272.8
Conv. Total (cfs)	221517.1	Wetted Per. (ft)	1098.54	74.02	1861.80
Length Wtd. (ft)	270.05	Shear (lb/sq ft)	0.11	0.53	0.24
Min Ch EI (ft)	112.35	Stream Power (lb/ft s)	4984.00	0.00	0.00
Alpha	3.41	Cum Volume (acre-ft)	9935.47	7758.44	14876.40
Frctn Loss (ft)	0.54	Cum SA (acres)	2335.21	693.13	3103.13
C & E Loss (ft)	0.01				

Cross Section Output

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192514.9 Plan: Mult

Plan: Mult Patuxent River 1 RS: 192514.9 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.28	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.18	Reach Len. (ft)	640.52	833.38	848.74
W.S. Elev (ft)	118.10	Flow Area (sq ft)	1199.73	337.34	3937.69
Crit W.S. (ft)	116.87	Area (sq ft)	1199.73	337.34	3938.17
E.G. Slope (ft/ft)	0.002582	Flow (cfs)	1100.68	2189.36	5602.96
Q Total (cfs)	8893.00	Top Width (ft)	1067.50	63.00	1627.09
Top Width (ft)	2757.59	Avg. Vel. (ft/s)	0.92	6.49	1.42
Vel Total (ft/s)	1.62	Hydr. Depth (ft)	1.12	5.35	2.43
Max Chl Dpth (ft)	6.00	Conv. (cfs)	21659.7	43083.4	110258.0
Conv. Total (cfs)	175001.1				

Length Wtd. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66	1621.91
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84	0.39
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00	0.00
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27	14849.93
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73	3092.12

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 191681.5 Plan: Mult

Plan: Mult Patuxent River 1 RS: 191681.5 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	116.14		
Vel Head (ft)	0.05		
W.S. Elev (ft)	116.08		
Crit W.S. (ft)			
E.G. Slope (ft/ft)	0.002637		
Q Total (cfs)	8893.00		
Top Width (ft)	3148.48		
Vel Total (ft/s)	1.34		
Max Chl Dpth (ft)	9.51		
Conv. Total (cfs)	173189.3		
Length Wtd. (ft)	801.69		
Min Ch El (ft)	112.33		
Alpha	1.85		
Frctn Loss (ft)	0.91		
C & E Loss (ft)	0.01		
Wt. n-Val.	0.100	0.030	0.100
Reach Len. (ft)	801.40	802.52	801.75
Flow Area (sq ft)	2137.27	121.79	4395.76
Area (sq ft)	2137.27	121.79	4395.76
Flow (cfs)	2379.06	617.68	5896.26
Top Width (ft)	1212.34	41.00	1895.14
Avg. Vel. (ft/s)	1.11	5.07	1.34
Hydr. Depth (ft)	1.76	2.97	2.32
Conv. (cfs)	46331.7	12029.2	114828.3
Wetted Per. (ft)	1212.90	43.25	1900.50
Shear (lb/sq ft)	0.29	0.46	0.38
Stream Power (lb/ft s)	4243.00	0.00	0.00
Cum Volume (acre-ft)	9903.71	7751.88	14768.74
Cum SA (acres)	2311.95	691.74	3057.80

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 190879.0 Plan: Mult

Plan: Mult Patuxent River 1 RS: 190879.0 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	115.22		
Vel Head (ft)	0.01		
W.S. Elev (ft)	115.21		
Crit W.S. (ft)			
E.G. Slope (ft/ft)	0.000624		
Q Total (cfs)	8893.00		
Top Width (ft)	3743.54		
Vel Total (ft/s)	0.79		
Max Chl Dpth (ft)	9.39		
Conv. Total (cfs)	355879.5		
Length Wtd. (ft)	779.48		
Min Ch El (ft)	108.76		
Alpha	1.10		
Frctn Loss (ft)	0.36		
C & E Loss (ft)	0.00		
Wt. n-Val.	0.100	0.030	0.100
Reach Len. (ft)	697.31	727.92	802.22
Flow Area (sq ft)	3318.91	89.96	7874.60
Area (sq ft)	3318.91	89.96	7874.60
Flow (cfs)	2361.45	181.41	6350.13
Top Width (ft)	1250.49	37.11	2455.94
Avg. Vel. (ft/s)	0.71	2.02	0.81
Hydr. Depth (ft)	2.65	2.42	3.21
Conv. (cfs)	94500.5	7259.8	254119.2
Wetted Per. (ft)	1251.21	43.26	2460.41
Shear (lb/sq ft)	0.10	0.08	0.12
Stream Power (lb/ft s)	4723.38	0.00	0.00
Cum Volume (acre-ft)	9853.52	7749.93	14655.82
Cum SA (acres)	2289.30	691.02	3017.76

## **Tractive Force Section (Hec-ras Output)**

**(Existing with Berm)**



## EXISTING CONDITION WITH BERM

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201119 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 201119 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	133.17		
Vel Head (ft)	1.53		
W.S. Elev (ft)	131.64		
Crit W.S. (ft)	131.64		
E.G. Slope (ft/ft)	0.006059		
Q Total (cfs)	8324.00		
Top Width (ft)	2291.19		
Vel Total (ft/s)	6.09		
Max Chl Dpth (ft)	9.69		
Conv. Total (cfs)	106934.9		
Length Wtd. (ft)	61.35		
Min Ch El (ft)	121.95		
Alpha	2.65		
Frctn Loss (ft)	0.30		
C & E Loss (ft)	0.29		
Wt. n-Val.	0.100	0.030	0.100
Reach Len. (ft)	55.20	60.26	138.48
Flow Area (sq ft)	478.21	655.35	232.29
Area (sq ft)	4182.05	655.35	747.25
Flow (cfs)	809.71	7052.29	462.00
Top Width (ft)	1767.59	137.00	386.60
Avg. Vel. (ft/s)	1.69	10.76	1.99
Hydr. Depth (ft)	1.77	4.78	2.26
Conv. (cfs)	10402.0	90597.8	5935.1
Wetted Per. (ft)	270.00	140.55	103.02
Shear (lb/sq ft)	0.67	1.76	0.85
Stream Power (lb/ft s)	5543.60	0.00	0.00
Cum Volume (acre-ft)	10289.32	7831.23	16038.22
Cum SA (acres)	2454.26	703.35	3463.86

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201058.7 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 201058.7 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	132.51		
Vel Head (ft)	0.95		
W.S. Elev (ft)	131.56		
Crit W.S. (ft)	130.88		
E.G. Slope (ft/ft)	0.004020		
Q Total (cfs)	8324.00		
Top Width (ft)	2057.15		
Vel Total (ft/s)	3.92		
Max Chl Dpth (ft)	8.60		
Conv. Total (cfs)	131279.3		
Length Wtd. (ft)	688.26		
Min Ch El (ft)	122.96		
Alpha	4.00		
Frctn Loss (ft)	2.12		
C & E Loss (ft)	0.22		
Wt. n-Val.	0.100	0.035	0.100
Reach Len. (ft)	508.58	943.33	306.29
Flow Area (sq ft)	1616.46	476.42	33.19
Area (sq ft)	6619.73	476.42	671.24
Flow (cfs)	3454.62	4823.01	46.37
Top Width (ft)	1750.17	60.00	246.99
Avg. Vel. (ft/s)	2.14	10.12	1.40
Hydr. Depth (ft)	3.42	7.94	1.84
Conv. (cfs)	54483.5	76064.5	731.3
Wetted Per. (ft)	473.16	65.33	18.38
Shear (lb/sq ft)	0.86	1.83	0.45
Stream Power (lb/ft s)	5020.26	0.00	0.00
Cum Volume (acre-ft)	10282.48	7830.44	16035.97
Cum SA (acres)	2452.03	703.22	3462.86

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 200115.4 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 200115.4 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	130.17		
Vel Head (ft)	0.22		
W.S. Elev (ft)	129.95		
Crit W.S. (ft)	129.73		
E.G. Slope (ft/ft)	0.002010		
Q Total (cfs)	8324.00		
Top Width (ft)	1913.15		
Vel Total (ft/s)	4.35		
Max Chl Dpth (ft)	7.90		
Conv. Total (cfs)	118279.3		
Length Wtd. (ft)	648.26		
Min Ch El (ft)	121.96		
Alpha	4.00		
Frctn Loss (ft)	2.12		
C & E Loss (ft)	0.22		
Wt. n-Val.	0.100	0.035	0.100
Reach Len. (ft)	508.58	943.33	306.29
Flow Area (sq ft)	1616.46	476.42	33.19
Area (sq ft)	6619.73	476.42	671.24
Flow (cfs)	3454.62	4823.01	46.37
Top Width (ft)	1750.17	60.00	246.99
Avg. Vel. (ft/s)	2.14	10.12	1.40
Hydr. Depth (ft)	3.42	7.94	1.84
Conv. (cfs)	54483.5	76064.5	731.3
Wetted Per. (ft)	473.16	65.33	18.38
Shear (lb/sq ft)	0.86	1.83	0.45
Stream Power (lb/ft s)	5020.26	0.00	0.00
Cum Volume (acre-ft)	10282.48	7830.44	16035.97
Cum SA (acres)	2452.03	703.22	3462.86

	0.22	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	129.95	Reach Len. (ft)	1501.45	1527.39	1537.60
W.S. Elev (ft)	128.14	Flow Area (sq ft)	3577.64	352.87	101.69
Crit W.S. (ft)	0.002460	Area (sq ft)	4398.99	352.87	4924.93
E.G. Slope (ft/ft)	8893.00	Flow (cfs)	6431.11	2361.21	100.68
Q Total (cfs)	2693.93	Top Width (ft)	1306.28	57.00	1330.65
Top Width (ft)	2.21	Avg. Vel. (ft/s)	1.80	6.69	0.99
Vel Total (ft/s)	14.53	Hydr. Depth (ft)	3.81	6.19	1.56
Max Chl Dpth (ft)	179299.5	Conv. (cfs)	129663.3	47606.4	2029.8
Conv. Total (cfs)	1519.13	Wetted Per. (ft)	939.20	62.29	65.32
Length Wtd. (ft)	122.06	Shear (lb/sq ft)	0.59	0.87	0.24
Min Ch El (ft)	2.93	Stream Power (lb/ft s)	5868.84	0.00	0.00
Alpha	2.99	Cum Volume (acre-ft)	10218.15	7821.47	16016.29
Frctn Loss (ft)	0.04	Cum SA (acres)	2434.19	701.95	3457.31
C & E Loss (ft)					

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 198588.0 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 198588.0 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	127.15	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.10	Reach Len. (ft)	993.28	988.41	937.73
W.S. Elev (ft)	127.05	Flow Area (sq ft)	1532.69	288.39	4244.69
Crit W.S. (ft)	0.001608	Area (sq ft)	1532.69	288.39	11766.61
E.G. Slope (ft/ft)	8893.00	Flow (cfs)	1560.28	1521.57	5811.16
Q Total (cfs)	4718.14	Top Width (ft)	686.01	50.00	3982.14
Top Width (ft)	1.47	Avg. Vel. (ft/s)	1.02	5.28	1.37
Vel Total (ft/s)	11.13	Hydr. Depth (ft)	2.23	5.77	2.21
Max Chl Dpth (ft)	221800.3	Conv. (cfs)	38914.8	37949.5	144936.0
Conv. Total (cfs)	950.12	Wetted Per. (ft)	686.21	52.85	1921.65
Length Wtd. (ft)	119.57	Shear (lb/sq ft)	0.22	0.55	0.22
Min Ch El (ft)	2.87	Stream Power (lb/ft s)	5710.31	0.00	0.00
Alpha	1.28	Cum Volume (acre-ft)	10115.93	7810.22	15721.70
Frctn Loss (ft)	0.01	Cum SA (acres)	2399.85	700.07	3363.54
C & E Loss (ft)					

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 197599.6 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 197599.6 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	125.86	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.06	Reach Len. (ft)	1000.40	1030.79	1005.50
W.S. Elev (ft)	125.80	Flow Area (sq ft)	71.79	229.04	6321.29
Crit W.S. (ft)	0.001141	Area (sq ft)	71.79	229.04	11163.05
E.G. Slope (ft/ft)	8893.00	Flow (cfs)	56.55	1054.03	7782.42
Q Total (cfs)	3567.93	Top Width (ft)	35.89	36.93	3495.10
Top Width (ft)	1.34	Avg. Vel. (ft/s)	0.79	4.60	1.23
Vel Total (ft/s)	10.18	Hydr. Depth (ft)	2.00	6.20	2.75
Max Chl Dpth (ft)	263288.3	Conv. (cfs)	1674.3	31205.9	230408.1
Conv. Total (cfs)	1010.19	Wetted Per. (ft)	36.52	39.84	2299.46
Length Wtd. (ft)	117.91	Shear (lb/sq ft)	0.14	0.41	0.20
Min Ch El (ft)	2.13	Stream Power (lb/ft s)	5478.15	0.00	4505.90
Alpha					

Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	10097.63	7804.35	15474.89
C & E Loss (ft)	0.01	Cum SA (acres)	2391.62	699.09	3283.06

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196568.8 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 196568.8 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	124.57		
Vel Head (ft)	0.15		
W.S. Elev (ft)	124.43		
Crit W.S. (ft)	123.63		
E.G. Slope (ft/ft)	0.001419		
Q Total (cfs)	8893.00		
Top Width (ft)	3409.19		
Vel Total (ft/s)	1.49		
Max Chl Dpth (ft)	10.43		
Conv. Total (cfs)	236079.4		
Length Wtd. (ft)	210.48		
Min Ch El (ft)	115.84		
Alpha	4.24		
Frctn Loss (ft)	0.19		
C & E Loss (ft)	0.02		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	208.00	212.00	210.00
Flow Area (sq ft)	158.09	398.57	5394.89
Area (sq ft)	158.09	398.57	7376.87
Flow (cfs)	111.88	2280.30	6500.83
Top Width (ft)	111.12	56.00	3242.07
Avg. Vel. (ft/s)	0.71	5.72	1.20
Hydr. Depth (ft)	1.42	7.12	2.26
Conv. (cfs)	2969.9	60534.3	172575.1
Wetted Per. (ft)	111.21	58.91	2386.97
Shear (lb/sq ft)	0.13	0.60	0.20
Stream Power (lb/ft s)	4607.00	0.00	3660.00
Cum Volume (acre-ft)	10094.99	7796.93	15260.91
Cum SA (acres)	2389.93	697.99	3205.30

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196356.8 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 196356.8 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	124.36		
Vel Head (ft)	0.07		
W.S. Elev (ft)	124.29		
Crit W.S. (ft)	122.64		
E.G. Slope (ft/ft)	0.000646		
Q Total (cfs)	8893.00		
Top Width (ft)	3283.48		
Vel Total (ft/s)	1.16		
Max Chl Dpth (ft)	8.87		
Conv. Total (cfs)	349831.5		
Length Wtd. (ft)	698.78		
Min Ch El (ft)	115.42		
Alpha	3.31		
Frctn Loss (ft)	0.21		
C & E Loss (ft)	0.02		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	758.14	773.69	678.90
Flow Area (sq ft)	143.37	540.57	6962.69
Area (sq ft)	143.37	540.57	9617.62
Flow (cfs)	80.99	2143.07	6668.94
Top Width (ft)	77.98	69.00	3136.50
Avg. Vel. (ft/s)	0.56	3.96	0.96
Hydr. Depth (ft)	1.84	7.83	2.89
Conv. (cfs)	3186.1	84303.7	262341.8
Wetted Per. (ft)	78.39	76.78	2409.90
Shear (lb/sq ft)	0.07	0.28	0.12
Stream Power (lb/ft s)	5128.00	0.00	3707.00
Cum Volume (acre-ft)	10094.27	7794.64	15219.95
Cum SA (acres)	2389.48	697.68	3189.93

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 195583.1 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 195583.1 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	124.13	Wt. n-Val.	0.100	0.035	0.073
Vel Head (ft)	0.01	Reach Len. (ft)	614.52	765.33	638.85
W.S. Elev (ft)	124.11	Flow Area (sq ft)	2191.71	385.22	9893.16
Crit W.S. (ft)	120.41	Area (sq ft)	2191.71	385.22	9893.16
E.G. Slope (ft/ft)	0.000175	Flow (cfs)	875.38	787.13	7230.49
Q Total (cfs)	8893.00	Top Width (ft)	756.65	50.00	2216.29
Top Width (ft)	3022.94	Avg. Vel. (ft/s)	0.40	2.04	0.73
Vel Total (ft/s)	0.71	Hydr. Depth (ft)	2.90	7.70	4.46
Max Chl Dpth (ft)	10.66	Conv. (cfs)	66156.8	59487.8	546446.6
Conv. Total (cfs)	672091.2	Wetted Per. (ft)	756.99	55.53	2219.94
Length Wtd. (ft)	649.97	Shear (lb/sq ft)	0.03	0.08	0.05
Min Ch El (ft)	113.45	Stream Power (lb/ft s)	6050.74	0.00	3306.77
Alpha	1.61	Cum Volume (acre-ft)	10073.95	7786.42	15067.91
Frctn Loss (ft)	0.14	Cum SA (acres)	2382.22	696.63	3148.21
C & E Loss (ft)	0.00				

**Cross Section Output** [ - ] [ □ ] [ X ]

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 194817.8 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 194817.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	123.98	Wt. n-Val.	0.100	0.035	0.075
Vel Head (ft)	0.03	Reach Len. (ft)	862.16	963.36	666.85
W.S. Elev (ft)	123.95	Flow Area (sq ft)	1426.35	402.19	6861.77
Crit W.S. (ft)	120.17	Area (sq ft)	1426.35	402.19	6861.77
E.G. Slope (ft/ft)	0.000292	Flow (cfs)	763.49	1092.35	7037.16
Q Total (cfs)	8893.00	Top Width (ft)	465.45	50.00	1303.40
Top Width (ft)	1818.84	Avg. Vel. (ft/s)	0.54	2.72	1.03
Vel Total (ft/s)	1.02	Hydr. Depth (ft)	3.06	8.04	5.26
Max Chl Dpth (ft)	11.00	Conv. (cfs)	44674.7	63917.4	411770.7
Conv. Total (cfs)	520362.8	Wetted Per. (ft)	466.08	55.53	1305.20
Length Wtd. (ft)	807.55	Shear (lb/sq ft)	0.06	0.13	0.10
Min Ch El (ft)	112.95	Stream Power (lb/ft s)	5597.03	0.00	2243.11
Alpha	1.68	Cum Volume (acre-ft)	10048.43	7779.50	14945.04
Frctn Loss (ft)	0.43	Cum SA (acres)	2373.60	695.75	3122.41
C & E Loss (ft)	0.02				

**Cross Section Output** [ - ] [ □ ] [ X ]

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193854.4 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 193854.4 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	123.52	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.25	Reach Len. (ft)	512.60	496.50	483.90
W.S. Elev (ft)	123.27	Flow Area (sq ft)	4174.90	476.14	86.00
Crit W.S. (ft)	121.50	Area (sq ft)	4174.90	476.14	86.00
E.G. Slope (ft/ft)	0.001301	Flow (cfs)	5664.13	3113.47	115.40
Q Total (cfs)	8893.00	Top Width (ft)	1036.20	50.00	29.90
Top Width (ft)	1116.10	Avg. Vel. (ft/s)	1.36	6.54	1.34
Vel Total (ft/s)	1.88	Hydr. Depth (ft)	4.03	9.52	2.88
Max Chl Dpth (ft)	10.97	Conv. (cfs)	157025.6	86314.0	3199.2
Conv. Total (cfs)	246538.8	Wetted Per. (ft)	1036.70	53.97	30.34
Length Wtd. (ft)	504.39	Shear (lb/sq ft)	0.22	0.72	0.22
Min Ch El (ft)	112.20				

MIN Ch EI (ft)	112.30	Shear (lb/sq ft)	0.33	0.72	0.23
Alpha	4.59	Stream Power (lb/ft s)	5493.45	0.00	1878.29
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	9993.00	7769.79	14891.86
C & E Loss (ft)	0.10	Cum SA (acres)	2358.74	694.64	3112.20

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193357.9 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 193357.9 Profile: 10yr

E.G. Elev (ft)	122.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.21	Wt. n-Val.	0.100	0.030	0.055
W.S. Elev (ft)	121.23	Reach Len. (ft)	178.50	181.30	183.70
Crit W.S. (ft)	119.99	Flow Area (sq ft)	1991.08	520.71	13.07
E.G. Slope (ft/ft)	0.003281	Area (sq ft)	1991.08	520.71	13.07
Q Total (cfs)	8893.00	Flow (cfs)	3167.31	5699.17	26.53
Top Width (ft)	852.25	Top Width (ft)	779.17	65.00	8.08
Vel Total (ft/s)	3.52	Avg. Vel. (ft/s)	1.59	10.95	2.03
Max Chl Dpth (ft)	8.63	Hydr. Depth (ft)	2.56	8.01	1.62
Conv. Total (cfs)	155248.9	Conv. (cfs)	55293.0	99492.8	463.1
Length Wtd. (ft)	180.24	Wetted Per. (ft)	779.31	68.72	8.71
Min Ch EI (ft)	112.60	Shear (lb/sq ft)	0.52	1.55	0.31
Alpha	6.26	Stream Power (lb/ft s)	5267.00	0.00	1920.00
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	9956.72	7764.11	14891.31
C & E Loss (ft)	0.02	Cum SA (acres)	2348.06	693.99	3111.99

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193176.6 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 193176.6 Profile: 10yr

E.G. Elev (ft)	121.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.12	Wt. n-Val.	0.100	0.035	0.055
W.S. Elev (ft)	120.59	Reach Len. (ft)	299.20	309.60	325.30
Crit W.S. (ft)	120.59	Flow Area (sq ft)	2087.20	471.54	18.40
E.G. Slope (ft/ft)	0.004741	Area (sq ft)	2087.20	471.54	18.40
Q Total (cfs)	8893.00	Flow (cfs)	3645.42	5200.43	47.15
Top Width (ft)	1006.29	Top Width (ft)	935.41	60.00	10.87
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)	1.75	11.03	2.56
Max Chl Dpth (ft)	8.29	Hydr. Depth (ft)	2.23	7.86	1.69
Conv. Total (cfs)	129159.2	Conv. (cfs)	52944.9	75529.5	684.8
Length Wtd. (ft)	311.52	Wetted Per. (ft)	935.77	64.34	11.39
Min Ch EI (ft)	112.30	Shear (lb/sq ft)	0.66	2.17	0.48
Alpha	6.08	Stream Power (lb/ft s)	5282.77	0.00	1905.04
Frctn Loss (ft)	1.52	Cum Volume (acre-ft)	9948.37	7762.04	14891.25
C & E Loss (ft)	0.22	Cum SA (acres)	2344.54	693.73	3111.95

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 192867 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 192867 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.16	Wt. n-Val.	0.100	0.035	0.055
Vel Head (ft)	0.39	Reach Len. (ft)	93.00	92.30	92.00
W.S. Elev (ft)	118.76	Flow Area (sq ft)	986.58	327.57	2047.47
Crit W.S. (ft)		Area (sq ft)	986.58	327.57	2104.48
E.G. Slope (ft/ft)	0.005052	Flow (cfs)	969.66	2739.45	5183.89
Q Total (cfs)	8893.00	Top Width (ft)	1098.81	68.56	1422.49
Top Width (ft)	2589.85	Avg. Vel. (ft/s)	0.98	8.36	2.53
Vel Total (ft/s)	2.65	Hydr. Depth (ft)	0.90	4.78	1.44
Max Chl Dpth (ft)	6.46	Conv. (cfs)	13642.6	38542.6	72934.5
Conv. Total (cfs)	125119.7	Wetted Per. (ft)	1098.95	71.00	1422.58
Length Wtd. (ft)	92.18	Shear (lb/sq ft)	0.28	1.46	0.45
Min Ch El (ft)	112.30	Stream Power (lb/ft s)	5084.00	0.00	0.00
Alpha	3.63	Cum Volume (acre-ft)	9937.81	7759.20	14883.32
Frctn Loss (ft)	0.24	Cum SA (acres)	2337.56	693.27	3106.60
C & E Loss (ft)	0.08				

Cross Section Output

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192774.7 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 192774.7 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.83	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.11	Reach Len. (ft)	261.34	259.80	275.16
W.S. Elev (ft)	118.71	Flow Area (sq ft)	1206.93	391.02	4442.56
Crit W.S. (ft)		Area (sq ft)	1206.93	391.02	4442.56
E.G. Slope (ft/ft)	0.001612	Flow (cfs)	798.63	2021.39	6072.98
Q Total (cfs)	8893.00	Top Width (ft)	1098.46	69.00	1859.83
Top Width (ft)	3027.28	Avg. Vel. (ft/s)	0.66	5.17	1.37
Vel Total (ft/s)	1.47	Hydr. Depth (ft)	1.10	5.67	2.39
Max Chl Dpth (ft)	6.91	Conv. (cfs)	19893.2	50351.2	151272.8
Conv. Total (cfs)	221517.1	Wetted Per. (ft)	1098.54	74.02	1861.80
Length Wtd. (ft)	270.05	Shear (lb/sq ft)	0.11	0.53	0.24
Min Ch El (ft)	112.35	Stream Power (lb/ft s)	4984.00	0.00	0.00
Alpha	3.41	Cum Volume (acre-ft)	9935.47	7758.44	14876.40
Frctn Loss (ft)	0.54	Cum SA (acres)	2335.21	693.13	3103.13
C & E Loss (ft)	0.01				

Cross Section Output

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192514.9 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 192514.9 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.28	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.18	Reach Len. (ft)	640.52	833.38	848.74
W.S. Elev (ft)	118.10	Flow Area (sq ft)	1199.73	337.34	3937.69
Crit W.S. (ft)	116.87	Area (sq ft)	1199.73	337.34	3938.17
E.G. Slope (ft/ft)	0.002582	Flow (cfs)	1100.68	2189.36	5602.96
Q Total (cfs)	8893.00	Top Width (ft)	1067.50	63.00	1627.09
Top Width (ft)	2757.59	Avg. Vel. (ft/s)	0.92	6.49	1.42
Vel Total (ft/s)	1.62	Hydr. Depth (ft)	1.12	5.35	2.43
Max Chl Dpth (ft)	6.00	Conv. (cfs)	21659.7	43083.4	110258.0
Conv. Total (cfs)	175001.1				

Length Wtd. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66	1621.91
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84	0.39
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00	0.00
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27	14849.93
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73	3092.12

**Cross Section Output** [ - ] [ □ ] [ × ]

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 191681.5 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 191681.5 Profile: 10yr

E.G. Elev (ft)	116.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	116.08	Reach Len. (ft)	801.40	802.52	801.75
Crit W.S. (ft)		Flow Area (sq ft)	2137.27	121.79	4395.76
E.G. Slope (ft/ft)	0.002637	Area (sq ft)	2137.27	121.79	4395.76
Q Total (cfs)	8893.00	Flow (cfs)	2379.06	617.68	5896.26
Top Width (ft)	3148.48	Top Width (ft)	1212.34	41.00	1895.14
Vel Total (ft/s)	1.34	Avg. Vel. (ft/s)	1.11	5.07	1.34
Max Chl Dpth (ft)	9.51	Hydr. Depth (ft)	1.76	2.97	2.32
Conv. Total (cfs)	173189.3	Conv. (cfs)	46331.7	12029.2	114828.3
Length Wtd. (ft)	801.69	Wetted Per. (ft)	1212.90	43.25	1900.50
Min Ch El (ft)	112.33	Shear (lb/sq ft)	0.29	0.46	0.38
Alpha	1.85	Stream Power (lb/ft s)	4243.00	0.00	0.00
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	9903.71	7751.88	14768.74
C & E Loss (ft)	0.01	Cum SA (acres)	2311.95	691.74	3057.80

**Cross Section Output** [ - ] [ □ ] [ × ]

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 190879.0 Plan: Patuxent Riv

Plan: Patuxent Riv Patuxent River 1 RS: 190879.0 Profile: 10yr

E.G. Elev (ft)	115.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	115.21	Reach Len. (ft)	697.31	727.92	802.22
Crit W.S. (ft)		Flow Area (sq ft)	3318.91	89.96	7874.60
E.G. Slope (ft/ft)	0.000624	Area (sq ft)	3318.91	89.96	7874.60
Q Total (cfs)	8893.00	Flow (cfs)	2361.45	181.41	6350.13
Top Width (ft)	3743.54	Top Width (ft)	1250.49	37.11	2455.94
Vel Total (ft/s)	0.79	Avg. Vel. (ft/s)	0.71	2.02	0.81
Max Chl Dpth (ft)	9.39	Hydr. Depth (ft)	2.65	2.42	3.21
Conv. Total (cfs)	355879.5	Conv. (cfs)	94500.5	7259.8	254119.2
Length Wtd. (ft)	779.48	Wetted Per. (ft)	1251.21	43.26	2460.41
Min Ch El (ft)	108.76	Shear (lb/sq ft)	0.10	0.08	0.12
Alpha	1.10	Stream Power (lb/ft s)	4723.38	0.00	0.00
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	9853.52	7749.93	14655.82
C & E Loss (ft)	0.00	Cum SA (acres)	2289.30	691.02	3017.76

## **Tractive Force Section (Hec-ras Output)**

**(Proposed)**



## PROPOSED CONDITION

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201119 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 201119 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	133.17	Wt. n-Val.	0.100	0.030	0.100
Vel Head (ft)	1.53	Reach Len. (ft)	55.20	60.26	138.48
W.S. Elev (ft)	131.64	Flow Area (sq ft)	478.21	655.35	232.29
Crit W.S. (ft)	131.64	Area (sq ft)	4182.05	655.35	747.25
E.G. Slope (ft/ft)	0.006059	Flow (cfs)	809.71	7052.29	462.00
Q Total (cfs)	8324.00	Top Width (ft)	1767.59	137.00	386.60
Top Width (ft)	2291.19	Avg. Vel. (ft/s)	1.69	10.76	1.99
Vel Total (ft/s)	6.09	Hydr. Depth (ft)	1.77	4.78	2.26
Max Chl Dpth (ft)	9.69	Conv. (cfs)	10402.0	90597.8	5935.1
Conv. Total (cfs)	106934.9	Wetted Per. (ft)	270.00	140.55	103.02
Length Wtd. (ft)	61.35	Shear (lb/sq ft)	0.67	1.76	0.85
Min Ch El (ft)	121.95	Stream Power (lb/ft s)	5543.60	0.00	0.00
Alpha	2.65	Cum Volume (acre-ft)	10154.08	7818.78	16149.15
Frctn Loss (ft)	0.30	Cum SA (acres)	2423.91	703.41	3491.27
C & E Loss (ft)	0.29				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 201058.7 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 201058.7 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	132.51	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.95	Reach Len. (ft)	508.58	943.33	306.29
W.S. Elev (ft)	131.56	Flow Area (sq ft)	1616.86	476.47	33.20
Crit W.S. (ft)	130.88	Area (sq ft)	6621.19	476.47	671.44
E.G. Slope (ft/ft)	0.004018	Flow (cfs)	3455.09	4822.53	46.38
Q Total (cfs)	8324.00	Top Width (ft)	1750.23	60.00	247.09
Top Width (ft)	2057.32	Avg. Vel. (ft/s)	2.14	10.12	1.40
Vel Total (ft/s)	3.91	Hydr. Depth (ft)	3.42	7.94	1.84
Max Chl Dpth (ft)	8.60	Conv. (cfs)	54505.8	76077.9	731.7
Conv. Total (cfs)	131315.4	Wetted Per. (ft)	473.16	65.33	18.38
Length Wtd. (ft)	688.34	Shear (lb/sq ft)	0.86	1.83	0.45
Min Ch El (ft)	122.96	Stream Power (lb/ft s)	5020.26	0.00	0.00
Alpha	4.00	Cum Volume (acre-ft)	10147.24	7818.00	16146.89
Frctn Loss (ft)	2.13	Cum SA (acres)	2421.68	703.28	3490.27
C & E Loss (ft)	0.22				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 200115.4 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 200115.4 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	130.16	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.22	Reach Len. (ft)	508.58	943.33	306.29
W.S. Elev (ft)	130.16	Flow Area (sq ft)	1616.86	476.47	33.20
Crit W.S. (ft)	130.16	Area (sq ft)	6621.19	476.47	671.44
E.G. Slope (ft/ft)	0.004018	Flow (cfs)	3455.09	4822.53	46.38
Q Total (cfs)	8324.00	Top Width (ft)	1750.23	60.00	247.09
Top Width (ft)	2057.32	Avg. Vel. (ft/s)	2.14	10.12	1.40
Vel Total (ft/s)	3.91	Hydr. Depth (ft)	3.42	7.94	1.84
Max Chl Dpth (ft)	8.60	Conv. (cfs)	54505.8	76077.9	731.7
Conv. Total (cfs)	131315.4	Wetted Per. (ft)	473.16	65.33	18.38
Length Wtd. (ft)	688.34	Shear (lb/sq ft)	0.86	1.83	0.45
Min Ch El (ft)	122.96	Stream Power (lb/ft s)	5020.26	0.00	0.00
Alpha	4.00	Cum Volume (acre-ft)	10147.24	7818.00	16146.89
Frctn Loss (ft)	2.13	Cum SA (acres)	2421.68	703.28	3490.27
C & E Loss (ft)	0.22				

Vel Head (ft)	0.22	Wt. n-val.	0.100	0.035	0.100
W.S. Elev (ft)	129.94	Reach Len. (ft)	1501.45	1527.39	1537.60
Crit W.S. (ft)	128.14	Flow Area (sq ft)	3567.20	352.24	100.97
E.G. Slope (ft/ft)	0.002482	Area (sq ft)	4384.49	352.24	4910.17
Q Total (cfs)	8893.00	Flow (cfs)	6428.38	2364.63	99.99
Top Width (ft)	2689.64	Top Width (ft)	1305.67	57.00	1326.97
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	1.80	6.71	0.99
Max Chl Dpth (ft)	14.52	Hydr. Depth (ft)	3.80	6.18	1.55
Conv. Total (cfs)	178504.9	Conv. (cfs)	129033.8	47464.1	2007.0
Length Wtd. (ft)	1519.13	Wetted Per. (ft)	939.20	62.29	65.26
Min Ch EI (ft)	122.06	Shear (lb/sq ft)	0.59	0.88	0.24
Alpha	2.93	Stream Power (lb/ft s)	5868.84	0.00	0.00
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	10082.99	7809.03	16127.27
C & E Loss (ft)	0.04	Cum SA (acres)	2403.84	702.01	3484.73

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 198588.0 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 198588.0 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	127.17		
Vel Head (ft)	0.09		
W.S. Elev (ft)	127.07		
Crit W.S. (ft)	125.89		
E.G. Slope (ft/ft)	0.001566		
Q Total (cfs)	8893.00		
Top Width (ft)	4538.79		
Vel Total (ft/s)	1.45		
Max Chl Dpth (ft)	11.15		
Conv. Total (cfs)	224715.8		
Length Wtd. (ft)	949.98		
Min Ch EI (ft)	119.57		
Alpha	2.86		
Frctn Loss (ft)	1.16		
C & E Loss (ft)	0.01		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	993.28	988.41	937.73
Flow Area (sq ft)	1548.23	289.52	4288.24
Area (sq ft)	1548.23	289.52	11333.60
Flow (cfs)	1565.30	1511.67	5816.03
Top Width (ft)	686.56	50.00	3802.24
Avg. Vel. (ft/s)	1.01	5.22	1.36
Hydr. Depth (ft)	2.26	5.79	2.23
Conv. (cfs)	39553.4	38198.1	146964.3
Wetted Per. (ft)	686.76	52.85	1927.43
Shear (lb/sq ft)	0.22	0.54	0.22
Stream Power (lb/ft s)	5710.31	0.00	5184.61
Cum Volume (acre-ft)	9980.74	7797.78	15840.58
Cum SA (acres)	2369.51	700.14	3394.21

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 197599.6 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 197599.6 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	126.00		
Vel Head (ft)	0.05		
W.S. Elev (ft)	125.95		
Crit W.S. (ft)	124.38		
E.G. Slope (ft/ft)	0.000973		
Q Total (cfs)	8893.00		
Top Width (ft)	3573.42		
Vel Total (ft/s)	1.28		
Max Chl Dpth (ft)	10.33		
Conv. Total (cfs)	285104.8		
Length Wtd. (ft)	1011.54		
Min Ch EI (ft)	117.91		
Alpha	2.04		
Wt. n-Val.	0.100	0.035	0.080
Reach Len. (ft)	1000.40	1030.79	1005.50
Flow Area (sq ft)	77.21	234.41	6655.22
Area (sq ft)	77.21	234.41	11670.83
Flow (cfs)	56.08	1010.18	7826.75
Top Width (ft)	38.74	37.00	3497.68
Avg. Vel. (ft/s)	0.73	4.31	1.18
Hydr. Depth (ft)	1.99	6.34	2.89
Conv. (cfs)	1797.8	32385.8	250921.2
Wetted Per. (ft)	39.37	39.93	2301.22
Shear (lb/sq ft)	0.12	0.36	0.18
Stream Power (lb/ft s)	5478.15	0.00	4505.90

Frctn Loss (ft)	1.80	Cum Volume (acre-ft)	9962.21	7791.83	15592.96
C & E Loss (ft)	0.05	Cum SA (acres)	2361.24	699.15	3315.63

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196568.8 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 196568.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	124.15	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.50	Reach Len. (ft)	208.00	212.00	210.00
W.S. Elev (ft)	123.65	Flow Area (sq ft)	75.46	354.89	3533.62
Crit W.S. (ft)	123.63	Area (sq ft)	75.46	354.89	4848.62
E.G. Slope (ft/ft)	0.004268	Flow (cfs)	64.79	3258.90	5569.31
Q Total (cfs)	8893.00	Top Width (ft)	90.70	56.00	3239.94
Top Width (ft)	3386.64	Avg. Vel. (ft/s)	0.86	9.18	1.58
Vel Total (ft/s)	2.24	Hydr. Depth (ft)	0.83	6.34	1.48
Max Chl Dpth (ft)	7.81	Conv. (cfs)	991.8	49885.6	85252.2
Conv. Total (cfs)	136129.6	Wetted Per. (ft)	90.72	58.91	2386.97
Length Wtd. (ft)	210.79	Shear (lb/sq ft)	0.22	1.61	0.39
Min Ch El (ft)	115.84	Stream Power (lb/ft s)	4607.00	0.00	3660.00
Alpha	6.45	Cum Volume (acre-ft)	9960.46	7784.86	15402.30
Frctn Loss (ft)	0.92	Cum SA (acres)	2359.75	698.05	3237.87
C & E Loss (ft)	0.01				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 196356.8 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 196356.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	123.22	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.58	Reach Len. (ft)	758.14	773.69	678.90
W.S. Elev (ft)	122.64	Flow Area (sq ft)	36.51	427.51	3142.33
Crit W.S. (ft)	122.64	Area (sq ft)	36.51	427.51	4747.42
E.G. Slope (ft/ft)	0.004478	Flow (cfs)	34.41	3878.10	4980.50
Q Total (cfs)	8893.00	Top Width (ft)	39.32	67.98	2930.05
Top Width (ft)	3037.35	Avg. Vel. (ft/s)	0.94	9.07	1.58
Vel Total (ft/s)	2.47	Hydr. Depth (ft)	0.93	6.29	1.41
Max Chl Dpth (ft)	7.22	Conv. (cfs)	514.2	57956.0	74430.7
Conv. Total (cfs)	132900.9	Wetted Per. (ft)	39.56	74.92	2233.68
Length Wtd. (ft)	704.13	Shear (lb/sq ft)	0.26	1.60	0.39
Min Ch El (ft)	115.42	Stream Power (lb/ft s)	4959.00	0.00	3979.00
Alpha	6.13	Cum Volume (acre-ft)	9960.19	7782.96	15379.17
Frctn Loss (ft)	1.49	Cum SA (acres)	2359.44	697.75	3223.00
C & E Loss (ft)	0.15				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 195583.1 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 195583.1 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	120.65				
Vel Head (ft)	0.07	Wt. n-Val.		0.035	0.058
W.S. Elev (ft)	120.58	Reach Len. (ft)	614.52	765.33	638.85
Crit W.S. (ft)	117.73	Flow Area (sq ft)		212.27	4272.05
E.G. Slope (ft/ft)	0.001230	Area (sq ft)		212.27	4812.06
Q Total (cfs)	8893.00	Flow (cfs)		826.64	8066.36
Top Width (ft)	2125.74	Top Width (ft)		46.09	2079.65
Vel Total (ft/s)	1.98	Avg. Vel. (ft/s)		3.89	1.89
Max Chl Dpth (ft)	7.31	Hydr. Depth (ft)		4.61	2.05
Conv. Total (cfs)	253562.8	Conv. (cfs)		23569.7	229993.1
Length Wtd. (ft)	648.93	Wetted Per. (ft)		50.19	2084.31
Min Ch EI (ft)	113.45	Shear (lb/sq ft)		0.32	0.16
Alpha	1.18	Stream Power (lb/ft s)	6001.00	0.00	3200.00
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	9959.87	7777.27	15304.68
C & E Loss (ft)	0.01	Cum SA (acres)	2359.10	696.73	3183.96

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 194817.8 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 194817.8 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	120.08				
Vel Head (ft)	0.04	Wt. n-Val.		0.035	0.057
W.S. Elev (ft)	120.04	Reach Len. (ft)	862.16	963.36	666.85
Crit W.S. (ft)	117.26	Flow Area (sq ft)		210.13	5313.45
E.G. Slope (ft/ft)	0.000649	Area (sq ft)		210.13	7532.76
Q Total (cfs)	8893.00	Flow (cfs)		591.45	8301.55
Top Width (ft)	1912.64	Top Width (ft)		46.00	1866.64
Vel Total (ft/s)	1.61	Avg. Vel. (ft/s)		2.81	1.56
Max Chl Dpth (ft)	8.77	Hydr. Depth (ft)		4.57	2.85
Conv. Total (cfs)	349082.8	Conv. (cfs)		23216.5	325866.4
Length Wtd. (ft)	697.85	Wetted Per. (ft)		50.05	1871.11
Min Ch EI (ft)	112.95	Shear (lb/sq ft)		0.17	0.12
Alpha	1.08	Stream Power (lb/ft s)	5597.03	0.00	2225.00
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	9959.87	7773.56	15214.16
C & E Loss (ft)	0.00	Cum SA (acres)	2359.10	695.92	3155.02

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193854.4 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 193854.4 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.63				
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.035	0.055
W.S. Elev (ft)	119.56	Reach Len. (ft)	512.60	496.50	483.90
Crit W.S. (ft)	117.26	Flow Area (sq ft)	629.93	343.81	4100.08
E.G. Slope (ft/ft)	0.000635	Area (sq ft)	629.93	343.81	7309.60
Q Total (cfs)	8893.00	Flow (cfs)	236.71	1112.03	7544.26
Top Width (ft)	1622.91	Top Width (ft)	639.21	63.00	920.69
Vel Total (ft/s)	1.75	Avg. Vel. (ft/s)	0.38	3.23	1.84
Max Chl Dpth (ft)	8.29	Hydr. Depth (ft)	0.99	5.46	4.45
Conv. Total (cfs)	352853.5	Conv. (cfs)	9392.0	44122.9	299338.6
Length Wtd. (ft)	487.01	Wetted Per. (ft)	639.48	65.42	922.97
Min Ch EI (ft)	112.95	Shear (lb/sq ft)	0.34	0.31	0.12
Alpha	1.08	Stream Power (lb/ft s)	1111.11	0.00	1111.11
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	9959.87	7773.56	15214.16
C & E Loss (ft)	0.00	Cum SA (acres)	2359.10	695.92	3155.02

MIN Ch EI (ft)	112.30	Shear (lb/sq ft)	0.04	0.21	0.18
Alpha	1.36	Stream Power (lb/ft s)	5419.00	0.00	1820.00
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	9953.64	7767.44	15100.55
C & E Loss (ft)	0.01	Cum SA (acres)	2352.78	694.72	3133.69

**Cross Section Output** [ - ] [ ] [ X ]

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193357.9 [ ] [ ] [ ] [ ] Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 193357.9 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.19		
Vel Head (ft)	0.19		
W.S. Elev (ft)	119.00		
Crit W.S. (ft)	117.26		
E.G. Slope (ft/ft)	0.001318		
Q Total (cfs)	8893.00		
Top Width (ft)	1254.21		
Vel Total (ft/s)	2.52		
Max Chl Dpth (ft)	7.73		
Conv. Total (cfs)	244925.6		
Length Wtd. (ft)	183.14		
Min Ch EI (ft)	112.60		
Alpha	1.88		
Frctn Loss (ft)	0.10		
C & E Loss (ft)	0.05		
Wt. n-Val.	0.100	0.030	0.054
Reach Len. (ft)	178.50	181.30	183.70
Flow Area (sq ft)	495.95	377.44	2661.86
Area (sq ft)	495.95	377.44	4947.36
Flow (cfs)	271.32	2123.95	6497.73
Top Width (ft)	485.70	65.00	703.51
Avg. Vel. (ft/s)	0.55	5.63	2.44
Hydr. Depth (ft)	1.02	5.81	3.78
Conv. (cfs)	7472.6	58496.5	178956.5
Wetted Per. (ft)	485.71	68.19	705.14
Shear (lb/sq ft)	0.08	0.46	0.31
Stream Power (lb/ft s)	5267.00	0.00	1950.00
Cum Volume (acre-ft)	9947.01	7763.33	15032.47
Cum SA (acres)	2346.16	693.99	3124.66

**Cross Section Output** [ - ] [ ] [ X ]

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 193176.6 [ ] [ ] [ ] [ ] Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 193176.6 Profile: 10yr

Element	Left OB	Channel	Right OB
E.G. Elev (ft)	119.04		
Vel Head (ft)	0.03		
W.S. Elev (ft)	119.01		
Crit W.S. (ft)	117.25		
E.G. Slope (ft/ft)	0.000309		
Q Total (cfs)	8893.00		
Top Width (ft)	2411.84		
Vel Total (ft/s)	1.17		
Max Chl Dpth (ft)	8.74		
Conv. Total (cfs)	505566.9		
Length Wtd. (ft)	323.08		
Min Ch EI (ft)	112.30		
Alpha	1.35		
Frctn Loss (ft)	0.10		
C & E Loss (ft)	0.00		
Wt. n-Val.	0.100	0.035	0.055
Reach Len. (ft)	299.20	309.60	325.30
Flow Area (sq ft)	728.94	376.74	6514.62
Area (sq ft)	728.94	376.74	14040.36
Flow (cfs)	225.41	913.58	7754.01
Top Width (ft)	694.04	60.00	1657.80
Avg. Vel. (ft/s)	0.31	2.42	1.19
Hydr. Depth (ft)	1.05	6.28	3.93
Conv. (cfs)	12814.7	51936.8	440815.3
Wetted Per. (ft)	694.26	64.38	1666.03
Shear (lb/sq ft)	0.02	0.11	0.08
Stream Power (lb/ft s)	5282.77	0.00	1900.00
Cum Volume (acre-ft)	9944.50	7761.76	14992.43
Cum SA (acres)	2343.74	693.73	3119.69

**Cross Section Output** [ - ] [ ] [ X ]

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 192867 [ ] [ ] [ ] [ ] Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 192867 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.93	Wt. n-Val.	0.100	0.035	0.055
Vel Head (ft)	0.02	Reach Len. (ft)	93.00	92.30	92.00
W.S. Elev (ft)	118.91	Flow Area (sq ft)	1150.09	337.79	6732.97
Crit W.S. (ft)		Area (sq ft)	1150.09	337.79	12273.37
E.G. Slope (ft/ft)	0.000311	Flow (cfs)	310.71	713.92	7868.38
Q Total (cfs)	8893.00	Top Width (ft)	1099.55	68.80	1752.73
Top Width (ft)	2921.08	Avg. Vel. (ft/s)	0.27	2.11	1.17
Vel Total (ft/s)	1.08	Hydr. Depth (ft)	1.05	4.91	3.84
Max Chl Dpth (ft)	7.91	Conv. (cfs)	17607.5	40457.3	445895.0
Conv. Total (cfs)	503959.8	Wetted Per. (ft)	1099.70	71.29	1754.35
Length Wtd. (ft)	92.12	Shear (lb/sq ft)	0.02	0.09	0.07
Min Ch EI (ft)	112.30	Stream Power (lb/ft s)	5084.00	0.00	0.00
Alpha	1.34	Cum Volume (acre-ft)	9938.05	7759.22	14894.17
Frctn Loss (ft)	0.06	Cum SA (acres)	2337.58	693.27	3106.95
C & E Loss (ft)	0.01				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192774.7 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 192774.7 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.87	Wt. n-Val.	0.100	0.035	0.080
Vel Head (ft)	0.14	Reach Len. (ft)	261.34	259.80	275.16
W.S. Elev (ft)	118.73	Flow Area (sq ft)	1223.62	392.06	4173.27
Crit W.S. (ft)		Area (sq ft)	1223.62	392.06	4470.75
E.G. Slope (ft/ft)	0.001846	Flow (cfs)	871.11	2173.14	5848.75
Q Total (cfs)	8893.00	Top Width (ft)	1103.77	69.00	1861.18
Top Width (ft)	3033.94	Avg. Vel. (ft/s)	0.71	5.54	1.40
Vel Total (ft/s)	1.54	Hydr. Depth (ft)	1.11	5.68	2.24
Max Chl Dpth (ft)	6.93	Conv. (cfs)	20273.5	50575.8	136119.0
Conv. Total (cfs)	206968.3	Wetted Per. (ft)	1103.86	74.02	1863.15
Length Wtd. (ft)	269.86	Shear (lb/sq ft)	0.13	0.61	0.26
Min Ch EI (ft)	112.35	Stream Power (lb/ft s)	4984.00	0.00	0.00
Alpha	3.75	Cum Volume (acre-ft)	9935.52	7758.45	14876.49
Frctn Loss (ft)	0.59	Cum SA (acres)	2335.23	693.13	3103.13
C & E Loss (ft)	0.00				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr  
 Reach 1 RS: 192514.9 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 192514.9 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	118.28	Wt. n-Val.	0.100	0.035	0.100
Vel Head (ft)	0.18	Reach Len. (ft)	640.52	833.38	848.74
W.S. Elev (ft)	118.10	Flow Area (sq ft)	1199.73	337.34	3937.69
Crit W.S. (ft)	116.87	Area (sq ft)	1199.73	337.34	3938.17
E.G. Slope (ft/ft)	0.002582	Flow (cfs)	1100.68	2189.36	5602.96
Q Total (cfs)	8893.00	Top Width (ft)	1067.50	63.00	1627.09
Top Width (ft)	2757.59	Avg. Vel. (ft/s)	0.92	6.49	1.42
Vel Total (ft/s)	1.62	Hydr. Depth (ft)	1.12	5.35	2.43
Max Chl Dpth (ft)	6.00	Conv. (cfs)	21659.7	43083.4	110258.0
Conv. Total (cfs)	175001.1				

Length W/d. (ft)	805.58	Wetted Per. (ft)	1067.98	64.66	1621.91
Min Ch El (ft)	112.40	Shear (lb/sq ft)	0.18	0.84	0.39
Alpha	4.45	Stream Power (lb/ft s)	6170.70	0.00	0.00
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	9928.25	7756.27	14849.93
C & E Loss (ft)	0.04	Cum SA (acres)	2328.71	692.73	3092.12

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 191681.5 Plan: Plan 03

Plan: Plan 03 Patuxent River 1 RS: 191681.5 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	116.14	Wt. n-Val.	0.100	0.030	0.100
Vel Head (ft)	0.05	Reach Len. (ft)	801.40	802.52	801.75
W.S. Elev (ft)	116.08	Flow Area (sq ft)	2137.27	121.79	4395.76
Crit W.S. (ft)		Area (sq ft)	2137.27	121.79	4395.76
E.G. Slope (ft/ft)	0.002637	Flow (cfs)	2379.06	617.68	5896.26
Q Total (cfs)	8893.00	Top Width (ft)	1212.34	41.00	1895.14
Top Width (ft)	3148.48	Avg. Vel. (ft/s)	1.11	5.07	1.34
Vel Total (ft/s)	1.34	Hydr. Depth (ft)	1.76	2.97	2.32
Max Chl Dpth (ft)	9.51	Conv. (cfs)	46331.7	12029.2	114828.3
Conv. Total (cfs)	173189.3	Wetted Per. (ft)	1212.90	43.25	1900.50
Length W/d. (ft)	801.69	Shear (lb/sq ft)	0.29	0.46	0.38
Min Ch El (ft)	112.33	Stream Power (lb/ft s)	4243.00	0.00	0.00
Alpha	1.85	Cum Volume (acre-ft)	9903.71	7751.88	14768.74
Frctn Loss (ft)	0.91	Cum SA (acres)	2311.95	691.74	3057.80
C & E Loss (ft)	0.01				

**Cross Section Output**

File Type Options Help

River: Patuxent River Profile: 10yr

Reach 1 RS: 190879.0 Plan: Plan 03

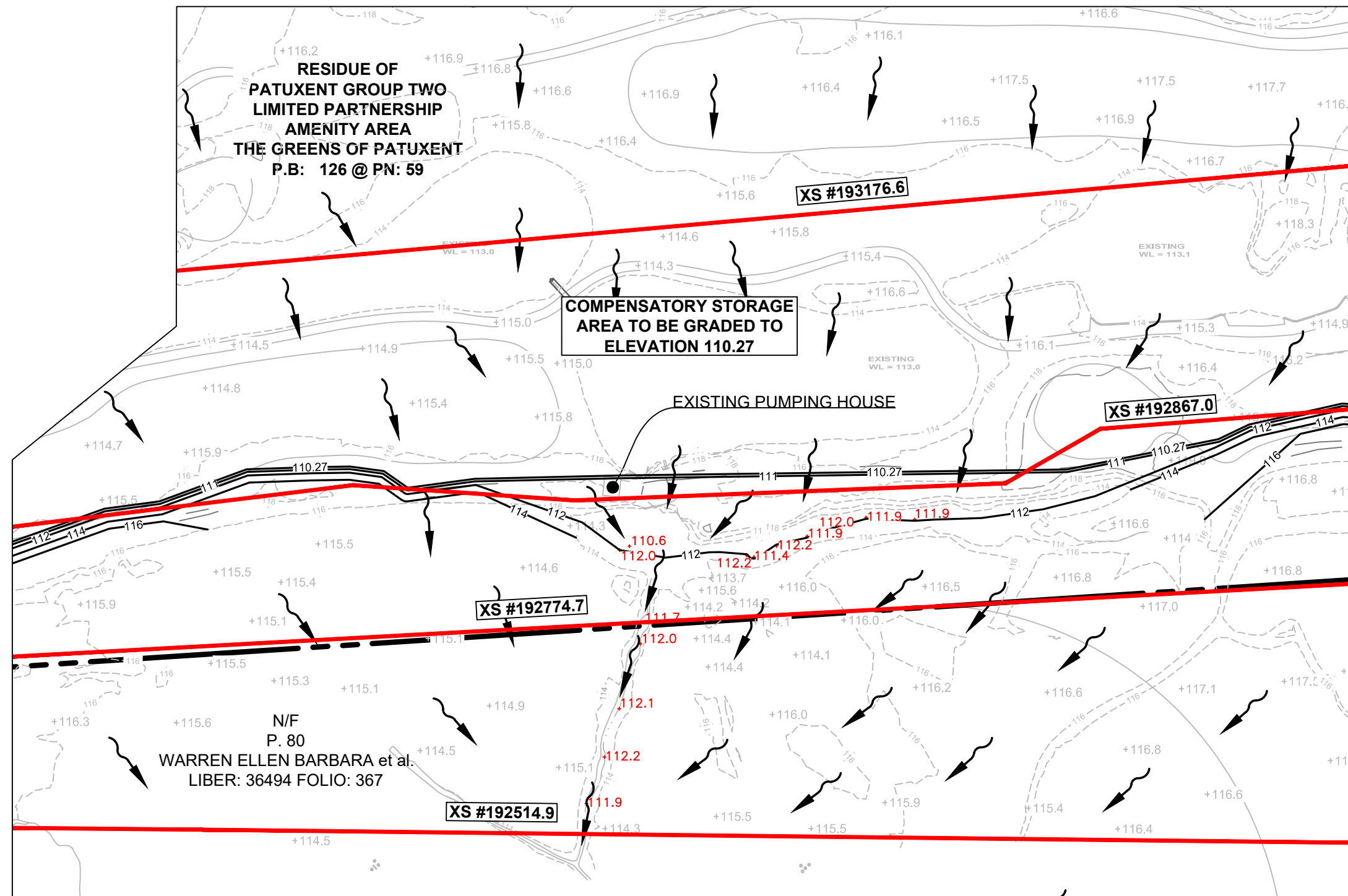
Plan: Plan 03 Patuxent River 1 RS: 190879.0 Profile: 10yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	115.22	Wt. n-Val.	0.100	0.030	0.100
Vel Head (ft)	0.01	Reach Len. (ft)	697.31	727.92	802.22
W.S. Elev (ft)	115.21	Flow Area (sq ft)	3318.91	89.96	7874.60
Crit W.S. (ft)		Area (sq ft)	3318.91	89.96	7874.60
E.G. Slope (ft/ft)	0.000624	Flow (cfs)	2361.45	181.41	6350.13
Q Total (cfs)	8893.00	Top Width (ft)	1250.49	37.11	2455.94
Top Width (ft)	3743.54	Avg. Vel. (ft/s)	0.71	2.02	0.81
Vel Total (ft/s)	0.79	Hydr. Depth (ft)	2.65	2.42	3.21
Max Chl Dpth (ft)	9.39	Conv. (cfs)	94500.5	7259.8	254119.2
Conv. Total (cfs)	355879.5	Wetted Per. (ft)	1251.21	43.26	2460.41
Length W/d. (ft)	779.48	Shear (lb/sq ft)	0.10	0.08	0.12
Min Ch El (ft)	108.76	Stream Power (lb/ft s)	4723.38	0.00	0.00
Alpha	1.10	Cum Volume (acre-ft)	9853.52	7749.93	14655.82
Frctn Loss (ft)	0.36	Cum SA (acres)	2289.30	691.02	3017.76
C & E Loss (ft)	0.00				

## **Appendix N**

### **Compensatory Outfall Elevation Exhibit**

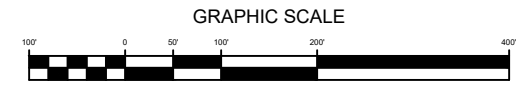




Scale: 1" = 100'  
 DATUM: NAD83/11 NAVD88

**LEGEND**

- Property Boundary
- Existing Minor Contour
- Existing Major Contour
- Proposed Minor Contour
- Proposed Major Contour
- Floodplain Section
- Proposed Flow Path
- Ex. Outfall Spot Elevation



PROFESSIONAL CERTIFICATION  
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.  
 LICENSE NO.: 32113      EXPIRATION DATE: 9/15/19



REVISION	DATE	REVISION	DATE	REVISION	DATE

Prepared For:  
 CS PATUXENT GREENS, LLC  
 6290 Montrose Road  
 Rockville, MD 20852  
 Attn: Alan D. Cohen  
 Phone: 301-692-4000

**FLOODPLAIN  
 OUTFALL EXHIBIT**

**RODGERS CONSULTING**  
 19847 Century Boulevard, Suite 200, Germantown, Maryland 20874  
 Ph: 301.948.4700    Fx: 301.948.6256    www.rodgers.com

BASE DATA	BY	DATE
DESIGNED		
DRAWN		
REVIEWED		
RODGERS CONTACT:		
RELEASE FOR		
BY		DATE

**Patuxent Greens**  
 10th Election District  
 The City of Laurel  
 Prince George's County, Maryland  
 Tax Map 41-E4

SCALE: 1" = 100'
JOB No. 1262A
DATE MAY 2019
SHEET No. 1 OF 1